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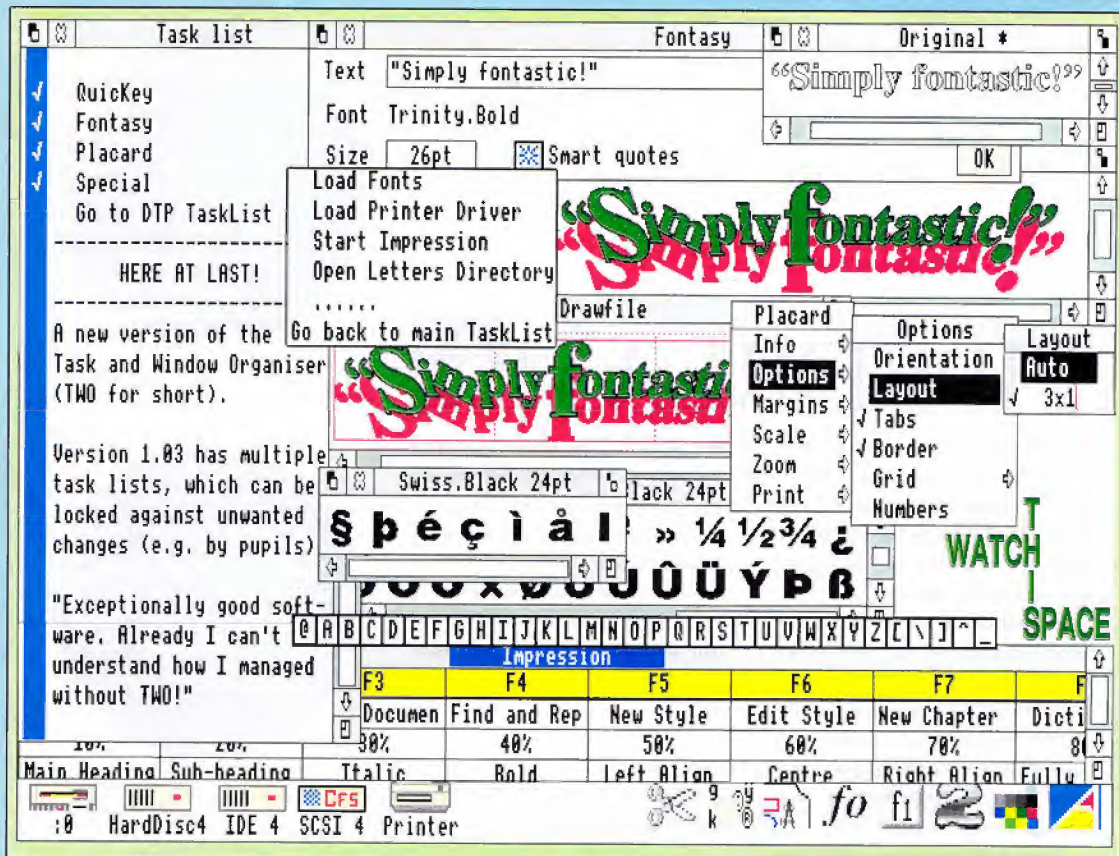
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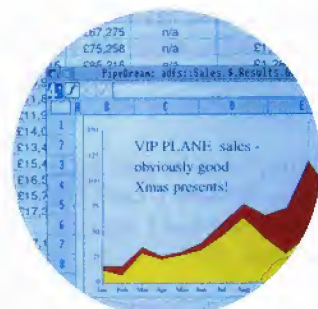
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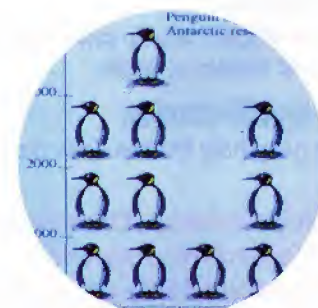
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10m	2266	7263	44	SH	13	17
1m	2418	7875	43	CH	14	1
1m	2212	7663	47	CH	8	
1m	2144	8263	42	WH	10	
1m	2470	7746	41	CH	10	





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Published by Redwood Publishing,
 a BBC Enterprises Company, 20-
 26 Brunswick Place, London N1
 6DJ. Tel: 071-490 1444. Telecom
 Gold 10081. RED001. Micronet
 919992492. Bureau setting and
 ad typesetting by Bold Gray Design, 52
 Rosebery Avenue, London, EC1R 4RP.
 Colour by Trumps Studio, Ware, Herts.
 Printed by Riverside Press, St Ives PLC,
 Gillingham. Distributed by BBC Frontline,
 Park House, 117 Park Road, Peter-
 borough. © Redwood Publishing 1992.
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 trademark of Acorn
 Computers Ltd. Redwood
 Publishing is a registered
 data user. ISSN 0263 7456.



PRODUCED ON THE ARCHIMEDES

All the editorial pages in
 BBC Acorn User are
 produced on a DTP
 system using Acorn
 Archimedes 440/1 and
 A540 computers, Com-
 puter Concepts' *Impres-
 sion 2* with Laser Direct
 printers and Taxan
 monitors

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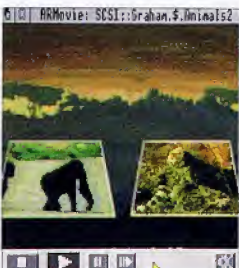
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95 ARTWORKS



62 CHORDS



120 COMPETITION



103 REPLAY



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What our readers say

...I would like to congratulate the publishers of RISC User for producing an excellent journal, the presentation of which is neat and stylish and the content lively and informative...I think that now you have achieved a good balance between articles for the novice and advanced user...

K. Gomm

...I find your magazine to be the best available for the Archimedes range of computers, and I am sure I have obtained far more information about the workings of these machines than all the others I read.

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...Congratulations on your articles for beginners, we could certainly do with more of them.

J.H. Luxton

...I wish to congratulate you for the continued excellence and highly interesting nature of your magazine, and sincerely hope that you will be able to maintain these standards for a long time to come.

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BIGGER VENUE FOR 1992 BBC ACORN USER SHOW

WEMBLEY Exhibition Centre will once again be the venue for the *BBC Acorn User Show* this Autumn.

Following the success of last year's event at the Wembley Conference Centre, which attracted over 10,000 people, this year's show will be held in the larger hall three of the Wembley complex. This will enable visitors to be admitted more easily and help avoid the queuing problems which resulted from Wembley safety regulations last year.

The show dates are Friday October 16 to Sunday October 18 1992, although the organisers, Safesell Exhibitions, are also keeping options open on an extra day (possibly Thursday October 15) for a special educational preview.

Discussions are taking place with Acorn Computers concerning the company's involvement with the show. With



A bigger venue will cater for crowds expected at this year's show

Autumn being a key time for new products, it is likely that the company will once again use the show as a launchpad.

Meanwhile, a large number of exhibitors from the Acorn marketplace have already booked space and early indications are that the show will

be bigger and better than ever.

Watch *BAU* for more details in the near future – meanwhile, make a note in your diary for October 16 to 18.

Initial enquiries concerning stand space should be directed to Safesell Exhibitions. Tel: (0737) 814084.

DIRECT COLOUR FOR THE ARC

AFTER the success of the Archimedes-dedicated LaserDirect printer range, Computer Concepts has turned its attention to the colour printing market. The result is ColourDirect, a 24-bit colour printing package based around Canon's brand-new BJC800 colour ink-jet printer. The BJC800 is a 360dpi (dots per inch) printer and, unlike some of the cheaper alternatives, the Canon is said to print true blacks resulting in superior contrast. ColourDirect printouts seen by *BAU* were certainly impressive. Another advantage of the BJC800 is that it can print up to A3.

Rise OS only handles eight-bit colour palettes at present, which limits printed results to 256 colours, even though the Archimedes has a selection of 4096 colours. However, Computer Concepts' printer driver



The BJC800 used in the ColourDirect package from Computer Concepts

is 24-bit colour capable, to match the ability of the printer. This provision also anticipates future Archimedes video chip developments. CC also claims its printer driver code, which addresses the parallel port directly, is extremely fast and can work in the background.

Computer Concepts sees

ColourDirect as a perfect match for the new *ArtWorks* package, as well as for existing *Impression* users. ColourDirect is due shortly and has a recommended price of £1995 plus VAT. At a later date, computer Concepts plans to sell the printer driver separately. Tel: (0442) 63933.

NEWS IN BRIEF

● **THREE** Acorn A5000 computers are at the heart of a new in-store broadcasting system being used by Asda supermarkets. The superstore chain has set up its own AsdaFM radio station which broadcasts to its 150 outlets via the Astra TV satellite. The three A5000s control scheduling operations, CD jukeboxes and an ISDN (Integrated Services Digital Network) telephone line, which distributes signals to the satellite uploader. The system is provided by Norsat International subsidiary, In-Store Media. Norsat's European director, Tom Woodford, explained that A5000s were chosen because of their networking and multitasking abilities – which means any one machine could take over the functions of another, guaranteeing reliability. Archimedes are now controlling operations at four other independent local radio stations – two in the UK and two in Malaysia.

● **AROUND** 100 works of art created by sixth form students from the London Borough of Enfield are being displayed on an Archimedes computer, which has been loaned by Acorn to the Design Council in London. The computerised art exhibition is the culmination of a project run by the Borough of Enfield to provide students with some experience in computer graphics. Initial designs were drawn on paper or photographed and then transferred to computer by using Minerva Software's Atelier paint program on the Archimedes. The selection of resulting pictures was then installed on an Archimedes running an Acorn sprite slide show utility called Picture. The exhibition will be at the Design Council until the summer.

● **IN THE** March issue we stated that the price of the Aleph One PC card with 1Mb RAM was £595 plus VAT. It has since been reduced to £495 plus VAT.

● **ACE COMPUTING's** *Euclid* package was used to create and animate a ham sandwich for Central TV's series *People Who Count*. It will appear on April 1. Contact Ace Computing on (0223) 322559.

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IDEAS FROM ANOTHER WORLD

KEEP an eye on the IBM PC-compatible market and, when a good idea comes along, make it work on the Archimedes. That is the strategy adopted by DT Software, which this month launches several new products.

First is a Floptical 21Mb floppy disc drive. This is a conventional looking 3.5in drive which has ultra-thin magnetic data tracks enabling a much greater recording density. Instead of the normal 135 tracks per inch (tpi) density, Floptical packs have over 1000tpi. A tiny LED optical sensor is used to guide the heads along laser etched grooves. It remains compatible with all existing 3.5in floppy disc media.

The Floptical drive is a SCSI device and DTS provides the necessary software for operation in the Archimedes environment. The drive is priced at £399.95 plus VAT and blank 21Mb discs will cost around £15 each.

Another new peripheral from DTS is Logitech's Fotoman camera. This is a black and white solid state camera which stores up to 32 pictures digitally in on-board Ram. Pictures are then downloaded to your machine via the serial port. DTS already sells an Archimedes camera system based around the Canon Ion



The Logitech Fotoman - digital image capture on the Archimedes

still-video camera. This system is colour whereas Fotoman is strictly monochrome, but the theory goes that Fotoman images will be considerably sharper, and of higher resolution because the image data is first-generation.

By comparison, analogue still-video images must first be digitised, a process which introduces a certain amount of distortion, and the luxury of colour must be paid for in lower resolution. The Fotoman camera can also take standard video camcorder lens attachments. An Arc Fotoman system is £553.15 plus VAT.

Finally, DTS has a new range of badged multiscan monitors sourced from Japan.

The range is made up of 14, 15, 17 and 21in displays. DTS points out that its monitors operate a scanning range of 15-38KHz, ideal for Archimedes screen modes, including modes 12 and 15. Other multiscan monitors often scan between 30-65KHz, which is not suitable for lower resolution screen modes.

The 15in and larger models also sport a four-setting video pre-set to minimise the need to constantly re-adjust the screen position when changing between certain screen modes. Prices are: 14in, £297.82; 15in, £485; 17in, £680.80; and 21in, £1046.76 (plus VAT).

Contact DT Software on (0223) 841099.

NEWS IN BRIEF

● The Acorn Software Roadshow is to roll once more in May, with five venues between May 11 and 15, starting off in Aberdeen in Scotland and ending in London. The schedule is as follows:

May 11, Northern College, Aberdeen; May 12, Mid/South Scotland, (venue to be announced); May 13, Cleveland ECC, Morton College, Middlesbrough; May 14, Education Development Centre, Sandwell; May 15, ILEC Centre, London.

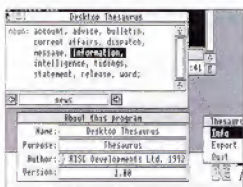
Another roadshow week is planned for November 23 to 27. For further information contact Acorn Computers on (0223) 245200.

● Dublin-based EMCEE Distribution Ltd has been appointed by Acorn as its sole distributor in the Republic of Ireland. EMCEE's task will be to build on Acorn's strength in Irish primary schools and increase the company's presence in secondary schools, where the main competition comes from Apple Macintosh computers.

Marketing director Mike O'Riordan said that he hoped Acorn Learning Curve packs would increase the number of Archimedes used by families at home, complementing those already used at schools. EMCEE will be flying the Acorn flag at Computex, Ireland's biggest computer exhibition, at the end of March. The Irish President, Mary Robinson, recently opened a new 20-Archimedes computer room at the Good Shepherd Primary School in Churchtown, Co Dublin.

● Sherston Software has just released Split An Image, a range of cartoon clip art in Draw file format featuring the likes of John Major and Frank Bruno. The cartoons were drawn by artist Paul Hutchinson and transferred to Draw format by Sherston who have ensured that the caricatures remain easy to edit in Draw. Also included are a range of bodies to attach the heads to, and a book on how to use Draw to make the most of them. The pack contains around 100 cartoons and costs £19.95 plus VAT. Contact Sherston Software on (0666) 840433.

WORDS AT YOUR FINGERTIPS



RISC DEVELOPMENTS has announced *Desktop Thesaurus*. Over 11,000 key words are linked to a dictionary of about 90,000 synonyms. All the user has to do is type a word into a window and suggested synonyms are listed in

grammatical groups. Risc Developments says *Desktop Thesaurus* will work with most applications which involve text editing, including *Impression* and *Ovation*, even though there is no standardised 'hot-linking' in Risc OS.

The dictionary can also be modified by the user. To save memory, data is accessed from disc where it is stored in compressed form. By the time this issue of *BAU* is out, *Desktop Thesaurus* should be on sale, at the very reasonable price of £19 plus VAT.

Computer Concepts is expected to release its thesaurus at a later date. *Word 4 Word* will be based on the *Collins Gems Thesaurus*. CC hope to make *Word 4 Word* work in the background, and with later versions of *Impression*, double clicking on a word will start the search through the thesaurus. The synonyms are then shown a window, and clicking on one will replace the selected word.

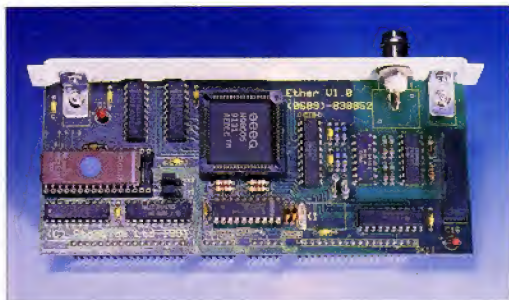
Contact Risc Developments on (0727) 40303 and Computer Concepts on (0442) 63933.

FASTER NETWORKING ON THE ARC

ETHERNET looks set to become a faster solution to networking on the Archimedes and BBC A3000. It can work up to 20-times faster than Econet and is rapidly becoming an industry standard for IBM PCs, Apple Macs and Unix machines.

Acorn first provided an Ethernet interface card for the Archimedes when the Unix-based R140 derivative was launched three years ago. Now Atomwide Ltd has joined in by releasing a pair of Ethernet cards: one is 16-bit version for the Archimedes' standard podule expansion bus, and the other a compact (eight-bit) version for the A3000's internal slot.

Ethernet on the Archimedes can be used as a faster alternative to the traditional but



The A3000 version of Atomwide's Ethernet card

ageing Econet system. Alternatively, it can be employed as a way of attaching Arcs to existing Ethernet networks. Acorn already provides TCP/IP connectivity protocols for the latter, and the forthcoming Acorn Universal Network

system will provide Ethernet networks with an extended Econet-style environment, compatible with level four file servers. Both versions of the new card cost £229 plus VAT. Contact Atomwide on (0689) 838852.

SOFTWARE SHOW

WHETHER you are a first-time buyer or an expert, choosing software for business and home use can be a challenge. Which is why you should tune in to *The Software Show*, a 90-minute programme covering all you need to know about choosing and using software for profit. Aimed at both business and home users, there will be plenty of advice on choosing software for a variety of platforms, including the Archimedes.

Helpful case studies featuring companies and individuals making software choices will be included. The programme will also cover training, data protection, viruses and piracy.

The programme will feature an Archimedes in the studio, which will be running popular software, such as *Pipedream* and *Impression*. There will also be a special competition to win the software featured.

The programme will be shown on BBC 1 at 10.30am on Sunday March 29. British Summertime falls on this day, so be sure to set your clocks back by one hour!

WATFORD TO LAUNCH A NEW PC PODULE

FOLLOWING hot on the heels of the first Archimedes PC podule from Aleph One, Watford Electronics has revealed details of a rival PC podule designed by prolific ex-Computer Concepts hardware expert, Chris Honey.

Apart from sharing the goal of providing a full-speed hardware-based PC environment on the Arc, it is interesting to note that the two competing designs differ in more than just minor details. The Watford card will feature a 25MHz AMD 386SX PC chip, claimed to be 25 percent faster than the 20MHz Intel 386SX processor used by Aleph One. While Aleph One decided to interface its card with Acorn's new *PC Emulator*, Watford Electronics has chosen to design what is effectively a stand-alone PC which can live inside the Archimedes. In other words, Watford's card could have an optional keyboard and monitor attached to it and two people could use a single machine at the same time - one using Rise OS and the other Dos.

However, the card is designed to work with Rise OS, complete with a multitasking PC window and access to existing Rise OS hard disc partitions.

Chris Honey says his design route avoids the display limitations of the PC Emulator, which can only partially emulate a full VGA screen. The Watford card will have 256K of video memory for a separate VGA monitor, which will also be able to display the Rise OS desktop. 2Mb of system memory will be provided as standard and there is a socket for an optional maths co-processor. Other options include high density (HD) 1.44Mb floppy drives, which are now standard on the new A5000, and an expander to accommodate up to two half-size PC bus expansion cards.

Availability of the Watford card has yet to be confirmed, but managing director Nazir Jessa hinted that pricing would be very competitive with Aleph One's PC cards, which are already on sale. Contact Watford Electronics on (0923) 37774.

NEWS IN BRIEF

● **THERE** have been some changes in Acorn's marketing personnel line up. Most notable is the arrival of new education marketing manager, Peter Talbot, from Commodore (see education column page 13). Simon Woodward takes on some of departing Warwick Hirst's former responsibilities for valued added solutions, within a new professional solutions operation, covering initiatives such as the Professional DTP package.

Consumer division manager Bob Coates takes on wider responsibilities as general manager of consumer and international markets. Corporate affairs manager, Brian Salter, also gets more responsibilities and is now head of publications and events organisation.

The reshuffle took place after the Computer Shopper Show last December, which was not regarded as a success for Acorn. Although it had a presence at the show, Acorn's stand space was booked late and there was no time to capitalise on its presence.

● **CRADDOCK** Computer Systems (CCS) has revealed that it is designing a modular memory upgrade system which will enable A5000 users to plug in a total of 16Mb of Ram. The upgrade features a motherboard which brings total memory up to 8Mb. This involves de-soldering the A5000's surface-mount Mem1a controller chip, which is why CCS carries out this part of the fitting. Extra 4Mb upgrades, giving a potential maximum of 16Mb, are provided in the form of small 'daughter cards' which plug into the motherboard. Contact CCS on (0604) 760991.

● **HEWLETT-PACKARD** has introduced a double capacity inkjet cartridge for its Deskjet range of printers. The old version used a sponge to attract the ink to the business end of the cartridge. Ink reservoir space has been saved by eliminating the sponge and the cartridge case is now transparent so you can see clearly when the ink is getting low. The new cartridge has a typical life of about 1,000 A4 sheets. The cartridge is priced at £21 plus VAT.



COMPOSE YOURSELF!

Last week, Miss Brown was in a tangle. Her music class wasn't prepared in time. One group wanted to play the drums, but the music budget barely stretches to a tambourine. Another wanted to write its own music, but it all got rather messy. In the end, she got them all to sing a round song.

This week, Miss Brown is using *Notate*. Now composing music is easy — notes, rests etc. can be placed directly on the screen. Then the music can be played back immediately, and changes made to rhythm, tempo or pitch. When it's done, they're going to print out their piece — a nice neat copy for every musician in the class.

Next week Miss Brown is going to introduce 'Music of the World'. African rhythms, marches, rap, pentatonic scales — *Notate* can do the lot. It's even simple to move individual parts between tunes — ever heard the National anthem with a reggae percussion section?

Notate uses the standard Archimedes 'voices'. The computer can sound like anything from a cow bell to a trombone, from a melodic tom-tom to a hand clap. And up to eight of these 'instruments' can be played at once.

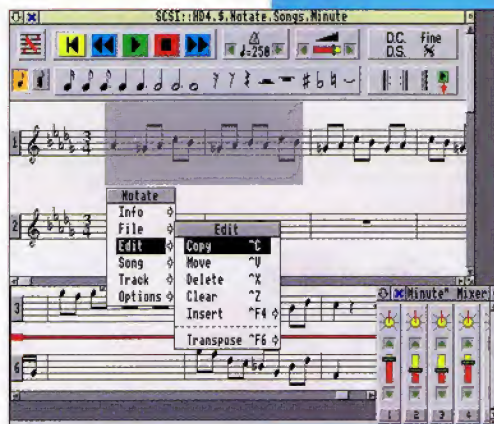
Miss Brown has a sound sampler attached to her Archimedes too, so she can record more of her own instruments. Including the human voice. So now three students are singing a barber shop quartet — the computer is humming the fourth part.

Whether you want to play percussion with seven year olds or think theory with seventeen year olds, **compose yourself — with *Notate*.**



Notate

DESIGNED IN THE CLASSROOM
FOR MUSICAL EDUCATION

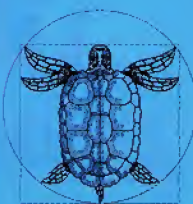


Notate offers the following features:

- ◆ Comprehensive support materials in the manual and on disk
- ◆ Up to eight individual staves
- ◆ A wide range of synthesised and sampled sounds
- ◆ Ability to use accidentals and repeats
- ◆ Full range of time and key signatures with control over tempo and volume
- ◆ Automatic checking of note length relative to the bar space remaining
- ◆ Easy-to-use tape recorder style control panel
- ◆ Chord facility
- ◆ Mixer controls to adjust stereo balance and volume of all tracks
- ◆ Configurable for different levels of musical skill
- ◆ Editing facilities which, like word processing, include cut, copy, move and delete within bars, staves or between compositions
- ◆ Up to four compositions editable simultaneously
- ◆ Ability to transpose single parts or whole compositions
- ◆ Export and import of MIDI format 1 files
- ◆ Ability to play via MIDI where a suitable interface is fitted.

Notate is available now, priced at £59.

A site licence for *Notate* costs £190 for a primary school and £330 for a secondary school



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Squirrel is the easiest to use database yet, allowing simple point and click database creation and queries.



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FLEXIBLE

Images, text and sound may be stored in the same database



NETWORK COMPATIBLE

Client/server design ensures that squirrel runs just as well on networks as standalone.



INTELLIGENT

Squirrel understands days of the week, months of the year and recognises files from other popular packages.



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Queries may be made onto other popular computers such as an IBM or Macintosh, even remotely over telephone lines.



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BULLETINS ON ECONET

BULLETIN is a new software package from the Scottish-based company XOB, that will allow users to run a bulletin board on Econet-linked A3000/Archimedes machines.

One of the benefits of a computer network is the ability to send electronic messages. But while electronic mail is useful, it does not have the advantages of a bulletin board. With *Bulletin*, individual users may examine messages left by others and reply to them, or initiate discussion on various topics. These can range from examination answers to plans for a school trip.

Messages left on *Bulletin* can be replied to at any time and topics may be open to all users, or restricted to closed user groups.

Bulletin will operate on any Rise OS (A3000, Archimedes, A5000) computer connected to an Econet network. Clicking on the *Bulletin* icon bar will

open a window on the first board of messages. The user may then scroll the text up and down and read any messages, each of which has a date stamp, the name of the sender and the intended recipient. Using standard desktop techniques, the user may simply view the topics or contribute their own messages.

Bulletin supports up to 20 simultaneous 'boards' or topics, although it is possible to extend this number if required. All files are encrypted and may only be read by *Bulletin* and a special utility provided for the system manager - this allows closed user groups to be established on less sophisticated file-servers. Those using the SJ Research MDFS have extra levels of security available.

Bulletin costs £67 and is available from XOB, Balkeerie, Angus, DD8 1SR. tel: (0307) 84364.

BIBLICAL EXPERIENCE

YOUNGSTERS can actually time-travel through biblical events, thanks to a new BBC A3000 audio-visual system. *Bibleworld* is a 20-minute journey put together by the National Bible Society of Scotland in Edinburgh.

It uses six A3000 computers, and has both sound and visual effects. Intrepid young 'time-travellers' can reconstruct a digitised picture from a 'visit' to Israel, test what they have learned from Bible characters, and set out on an adventure in Jerusalem at the time of Christ's birth.

The A3000 is also used by the society in the administration of *Bibleworld*, which includes keeping track of visitors, as well as developing new programs and ideas. Used in the system is HCCS's Hard Card, *Ovation* and *Impression* DTP software, plus special fonts and graphics.

Contact David Cochrane on 031-337 9701.

PARTNERSHIP FUNDING

TIGHT budgets are not unusual in schools, but at least one school in the Wakefield area has been able to buy a BBC A3000 computer and software, thanks to a partnership between education and local business. Knottingley C of E primary school recently benefited from a cash injection from Wakefield's Education Business Partnership to buy the equipment. The money was made available to schools

ROLLING IT

MINERVA Software's *PrimeArt* package can now run rolling displays from pictures produced using the package.

The *PrimeArt Display Kit* utility allows pictures created using the primary art package to be displayed in sequence, making it ideal for classroom demonstrations.

The rolling displays are produced by dropping saved pictures on to the screens directory and clicking on the icon. It costs £12 plus VAT.

Also, a new version of *PrimeArt* has an option for use in high-resolution mode 21. Other new features include support for a Concept Keyboard, options for sticky menus and brush matching.

The new version of *PrimeArt* costs £79.95 plus VAT, including site licence. Existing users can upgrade for £10 plus VAT by returning their original discs. Contact Minerva on (0392) 437756.

NEWS IN BRIEF

● **ACCORDING** to a recent edition of *Private Eye*, junior education minister Tim Eggar caused some embarrassed giggles when he opened the BETT Show recently. During his tour he was introduced to Acorn's managing director Sam Wauchope and, considerably impressed by the power of the Acorn machines, suggested that it might be a good idea if they were, er, used in our schools. After a short silence, Eggar's guide informed him of Acorn's contribution to educational hardware (found in 85 percent of schools) before moving the minister on.

● **MEANWHILE**, as revealed in our news pages this month, Acorn has finally appointed ex-Commodore man, Peter Talbot, as the new manager of its education division. Talbot, 38, was national sales manager responsible for government and education business at Commodore Business Machines. A former teacher, he also spent a couple of years running Granada Business Centres in London. Acorn's sales and marketing director, Mike O'Riordan, said: 'With Peter's combination of experience of the education market, and of sales and marketing, I am sure he will bring to Acorn a wealth of benefits that will help us to continue our leading role within the education sector.'

● **A MAJOR** step forward in examination administration by schools has been developed using the Archimedes. Over 450 schools will be involved in the project for the submission of exam entries, managed by the University of Cambridge Local Examination Syndicate and Campus 2000, supplier of electronic information services to education. Most of the 'spade work' for the project was carried out on the Archimedes. The software was then ported over to PCs, on which the system will run, although there is the possibility of linking into the UCLES project with an Archimedes machine. Campus 2000 is jointly operated by BT and Times Network Systems, tel: 071-782 7143.



The new computer funded by a school-business partnership

fax pack



**JUST PLUG
FAXPACK INTO
THE ARCHIMEDES
AND YOU'RE IN
BUSINESS**



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Tel: 0442 63933 Fax: 0442 231632

FaxPack is a fax expansion board for the Archimedes range of computers allowing your computer to take on the job of a conventional fax machine but with the benefits of being fully integrated into the Archimedes.

FaxPack offers full background send and receive capability. You can send a fax simply by selecting the PRINT option from any RISC OS application, with control returned in just a few seconds. FaxPack then proceeds to dial and send the fax while you carry on using the computer.

Receiving faxes is also completely automatic. FaxPack will answer the phone and store the fax away on your disc while you continue to use the computer. Once received the fax can be viewed on screen (using a special anti-aliased display to improve on-screen readability) and printed. Any portion of the fax image can be saved as a conventional sprite. Alternatively FaxPack can be made to automatically print on receipt of a fax, which with a LaserDirect printer, is completely automatic and in the background.

There are numerous advantages of a computer based fax system over a conventional machine:

- ☐ Very high quality, pixel perfect faxes - try sending a fax of 8pt text from a conventional fax machine!
- ☐ Since there is no need to print, then re-scan a document, FaxPack saves time, paper and money when sending faxes.
- ☐ Rather than junk fax mail wasting your costly fax paper, you can decide to delete unwanted fax files before printing.
- ☐ By receiving and sending from the computer FaxPack offers a higher level of security than most conventional fax machines.
- ☐ FaxPack allows electronic archiving of fax messages and is one step towards the truly paperless office.
- ☐ FaxPack uses your standard Archimedes printer and so can print on plain paper rather than thermal paper.

In addition FaxPack can be used as a data modem, to send and receive any Archimedes file or directory of files to other machines fitted with FaxPack. Because of the 9600 baud rate of fax systems and the use of data compression FaxPack is faster than practically all conventional data modems and permits background data transfer.

FaxPack £299 + VAT (£351.32)

APPROVED for connection to
telecommunication systems specified
in the instructions for use subject to
the conditions set out in them.

THE FAX EXPANSION BOARD FOR THE ARCHIMEDES



WHOSE LINE IS IT ANYWAY?

HOW many readers skip over the comms column, thinking that it's too complex for them. Maybe they have watched the film *Wargames* and imagine a whole sub-culture of boffins, hacking their way into hidden computer networks.

Well, nowadays it's not quite like that. Comms come into many aspects of life, from the cashpoint machine to ordering in a high street bookstore. At the home computer level, playing online games is a favourite comms pastime.

So, if you are a computer novice, how do you get

started? Well all you need is a modem, a computer and some suitable comms software. A modem is simply the box which plugs into your phone line and your computer. It converts your data into strange noises, sends them down the phone line into a modem at the other end, which then converts the strange noises back into computer data.

The comms software is simply a package that lets you choose the data to convert into strange noises, and send them whizzing down the phone line. You can pick up a modem for

as little as £50 nowadays and the comms software will cost about the same. To get started, you don't need to worry about speed and all that stuff – most systems that you dial up will adjust their speed to suit your modem. The only thing to remember is that the faster your modem, the cheaper your phone bill will be.

Comms software can often be bought at the same time as your modem but be warned – there are a lot to choose from. We will be looking at some over the coming months, to make your choice simpler.

NEWS IN BRIEF

● If you want a huge selection of PD and Shareware software, with over 2500 programs available, you should try The Shareware BBs on (0424) 830654: (8N1, ANSI, 300/1200/2400/9600 HST). Although it is currently biased towards PC users, Acorn support may increase if lots of users log on. Echomail conferences also support worldwide Netmail and on-line games such as Tradewars.

● Whoops! We would like to correct two errors that crept into our February column. The correct number for Silicon Village should be 081-759 6996. Also the price of the Computer Concepts Fax Pack is £299, not £200 as stated. Apologies to all concerned!

● Have you ever wished you could send Janet mail, via a bulletin board system? Well now you can. Sysop Edward Hobson of The Powerhouse BBS has just set up Janet E-Mail facilities on his board so that you can send messages to friends in universities around the country. The Powerhouse is on (0829) 782676.

● British Telecom has just extended its Telecom Gold system to link into the international Tymnet network. Use of the system will start at the beginning of March and allow access to over 20 countries, including the USA, Japan and most of Europe. For more information, call freephone customer helpline on (0800) 282444.

● Some A5000 users may be experiencing problems when using older style modems. This is because the serial port on the A5000 cannot support split baud rates such as 1200/75. If you want to log on to bulletin boards at this speed, you will need to upgrade to one that will buffer the computer speed for you.

● Ever wanted to run a bulletin board on your Arc but couldn't afford the cost of the software? Carl Decker has developed the first public domain host system for Arc users. More details in a future column but meanwhile keep an eye out for IRiscBBS on bulletin boards or in PD libraries.

ARCADE IN ACTION

FOR a newcomer, one of the best bulletin boards around has got to be Arcade. Based in Croydon, Arcade is probably the 'definitive' bulletin board for the Archimedes, and contains many celebrity names in the user log, including support from Acorn themselves via a comprehensive Acorn Support area and by a number of Acorn staff who log on regularly. If there is any new PD software or updates to existing software, you can generally be sure that it will go up on Arcade first.

The latest area on Arcade is Virus watch. This is a special area containing all the latest virus killers together with a run down of which viruses each will kill and any relevant

information to help keep your discs virus free.

If you're not on Acorn's mailing list, Arcade can also provide any new Acorn press releases, often before the magazines pick them up. A special download section contains text-only files of news stories updated the day they are released.

Arcade is run on a very friendly, club-like basis and users are always ready to help out newcomers, or anyone having problems with their system. In fact, every so often a number of users meet up for a drink, usually around the London area. Arcade are found on 081-654 2212 or 081-655 4412. Set your software to 8N1, ANSI.

OUT AND ABOUT

ONE bulletin board that has come to our attention has some rather unusual concerns. Wordsmith BB is designed to appeal to any scribes and other creative folk out there. It seems to be the UK home of writers and photographers and offers many bulletins and forums for budding writers to share ideas and comments.

The sysop is Marcus Harrison, and to contact Wordsmiths, set your software to 8N1 and call 071-603 3302.

A completely new BB to try is available on (0795) 471515. Called Pettets Paradise, it is based in Sittingbourne and run by Graham Pettett. According to Graham, there's lots of messages, lots of games, lots of files and lots of fun! It also supports Fidonet and Worldnet, running at all speeds from 300 baud right up to 14.4k baud. However, this BB is currently only available from 10.00pm to 7.30pm.

The Blackcat BBs, based in Penarth, South Wales is another new BBS to come to our attention. Running at all speeds from V21 up to V42bis and boasting 300Mbytes of online storage it caters for most machine types. If you know of any bulletin boards that you feel deserve our attention, please drop us a line!

Paul Vigay



Arcade: one of the friendliest bulletin boards around



ARCOL DESKTOP

EXPLAN'S Arcol graphics package has recently undergone a number of changes. The most important one is the ability to work in any 256 colour mode supported by the Archimedes. Up until now, it only worked in Mode 13 and it was restricted by the rather chunky 320x256 graphics.

The new Arcol Desktop installs itself on the menu bar like other Rise OS applications, but switches to full screen when run. A number of new tools have been added and existing ones upgraded and refined. The price is £50 for the single user version and £250 for a site license. Upgrading from the old version of Arcol to Arcol Desktop will cost £6.50. (All prices exclude VAT.)

For more details, contact Explain UK, St Catherine's House, 20 Plymouth Road, Tavistock, Devon, PL19, tel: (0822) 613868.



READER PIC OF THE MONTH

THIS month's special mention should go to S Goreham who at the grand young age of 75 has recently turned his hand to computer graphics. The ship

above is one that was produced using a friend's home-grown art package on an A3000 computer. Certainly an inspiring example!

NEWS IN BRIEF

● The recent BETT show at the Barbican saw the launch of a new A4, 300 dpi colour scanner. The price is remarkably cheap when compared to the competition, at £799. The German company responsible for the launch, called Cebas can be contacted at Cebas, Landstrasse 21, W-6945 Hirschberg-Grosssachsen, Germany. Tel: 010 49 6201 58130

● Readers of The Guardian's Computer section might have noticed Jack Schofield warning to an Acorn product!

To quote Mr Schofield, 'Acorn Replay was the highlight of last week's BETT exhibition at the Barbican, London.' He goes on to say that 'If anything, Replay looks better than QuickTime on the (Apple) Macintosh.'

Mr Schofield, we couldn't agree with you more! For those who didn't make it to the BETT show, both Replay and QuickTime are software packages that enable moving video to be shown on the desktop, without the need for any additional hardware such as compact discs.

To find out more, turn to our review of the Acorn Replay system on page 103.

FREEBIE RAY TRACERS

RAY TRACING is becoming increasingly popular among Archimedes users, and many programs are being converted to the 32-bit format. Most of the best ray tracers are in fact in the public domain, a source of quality programs which is often overlooked by the average computer owner.

QRT (Quick Ray Tracer) has been around for some time now and has been responsible for many of the demos circulating on bulletin boards and PD libraries. It is fully Rise OS compatible and runs on the desktop alongside other applications. Pictures are created by describing scenes in special script files, in a similar way to the original *Render Bender* program by Clares.

Output can be in any mode, as a sprite, or as a straight-forward 24-bit clear file which can be displayed to full effect with the PCATS Graphics Enhancer from Serial Port. MTV, on the other hand, is

also a popular public domain ray tracer and has similar features to QRT.

A new addition to the MTV pack is PVray which supports a number of advanced features such as texture mapping (taking a scanned image of wood, for example, and using the texture of the wood to provide the surface of an object.)

Both of these programs can be obtained from many public domain libraries (see our public domain feature on page 109 for some general information.) You may also be able to obtain the programs from bulletin boards such as Arcade featured in this month's comms page.

If you know of any other ray tracing programs, or even if have written your own ray tracer for the Arc, don't forget to let us know. Next month, this column will take a quick look at some of the painting packages that are available in the public domain.

Rob Miller

MIDNIGHT EXPRESS

DABHAND computing is to release *Midnight Express* at the end of March 92.

This is a presentation package of the same ilk as *Type-Studio* reviewed last month. *Midnight Express* will allow text to be placed in envelopes or around curves, but remain editable. Arm code has been used throughout, and the package is said to be virtually instantaneous in operation.

Predefined palettes are used for colour adjustment, removing the need to fiddle around with colour sliders, as in *Draw*. Preset envelopes are also defined and they can be placed on the page for editing.

A potentially impressive feature is the ability to tile or scale any sprite within an object, allowing complex backgrounds to be built up very quickly.

For more details, contact Dabhand on 061-766 8423.



VISION **£49** digitiser



Time to invest in a Black And White Digitiser.



Available from HCCS at only £49 + VAT. It collects any video signal from a video

recorder, CamCorder, LaserDisc Player or Canon Ion etc. and turns it into a standard

sprite



window. The high quality visuals enhance



any document; It has Contrast and Brightness controls which can be adjusted before or

after the video frame has been captured.



The Vision image

size is 640 pixels by 256 lines with 128 effective grey scales using ETT (Error Transfer

Technique)



A manual on disc, software and a lead are included in this

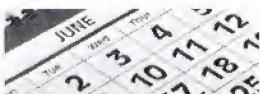
package. There is a Vision Digitiser to suit any Archimedes. The Vision Black and

White Digitiser is in stock now and a colour upgrade



will be

available in



June, with a discount to existing users. This

document was produced using a BBC A3000 and a Vision Digitiser:

A3000 Internal Vision	£49.00
A3000 External Vision	£62.00
Archimedes Vision (A300,A400,A500,A5000)	£49.00

ALL PRICES EXCLUDE VAT. E&OE.



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NEXT MONTH

ACORN^{BBB}USER

SPECIAL SUPPLEMENT: **PLUS**

10 YEARS OF THE BBC MICRO

It's 10 years since the BBC micro first appeared on our TV screens. Our special supplement looks at the first decade of home computing and goes behind the scenes of a BBC TV programme marking the event

MAKE AN IMPRESSION

The BBC A3000 and Archimedes have emerged as useful desktop publishing platforms, thanks to DTP packages like Computer Concepts' *Impression*. We give you some tips on how to make the most of it



DON'T MISS
the May issue of BAU
available Monday April 6

TALKING TO PCs

The new PC Card from Aleph One will allow your Archimedes to tap into the world of PC software. We check it out

EXTRA MEMORY FOR YOUR A5000

Several companies have produced additional Ram upgrades for the latest Archimedes A5000. We look at what is on offer

PRO SCANNING

We test the latest professional black and white scanner from Computer Concepts – the Scanlight 256

REGULARS

- All the latest news and views from the world of Acorn
- ★INFO – helpful advice and ideas covering the BBC A3000, Archimedes, A5000, BBC B and Master
- Your letters and problems
- Programs galore on the yellow pages and much more

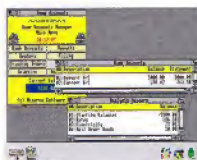
To be sure of your copy, please fill in the coupon below and hand it to your newsagent. Or why not take out a subscription, which includes a free monthly disc? See page 29 for details

DEAR NEWSAGENT, PLEASE ORDER MY REGULAR COPY OF BBC ACORN USER

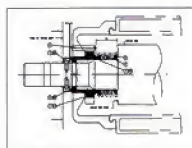
YOUR NAME _____

ADDRESS _____

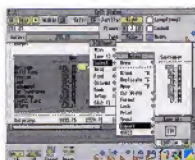
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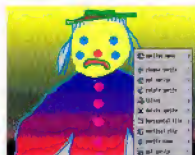
HOME ACCOUNTS



CADET



DESKTOP OFFICE

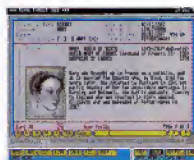


PRIMEART

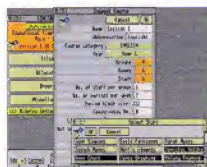


ATELIER

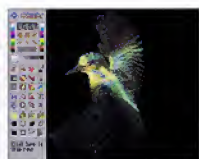
TAKE YOUR PICK!



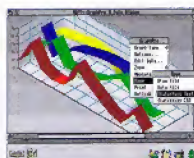
ANCESTRY



TIMETABLER



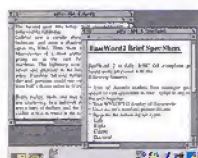
PRIMEART



GRAPHBOX PROFESSIONAL



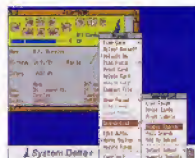
GRAPHBOX



EASIWORD v2



ATELIER



SYSTEM DELTA PLUS

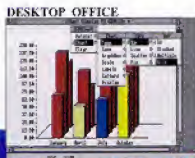
BUSINESS ACCOUNTS



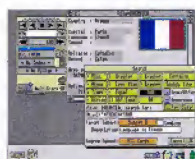
FLEXIFILE



BUSINESS ACCOUNTS



DESKTOP OFFICE



MULTISTORE v2



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...it's got to be one of ours

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50 Mb	£299.00
100 Mb	£449.00
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50 Mb	£345.00
100 Mb	£495.00
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High Speed Internal Hard Discs A300/400/500/5000

50 Mb	£339.00
100 Mb	£489.00
200 Mb	£775.00

High Speed External Hard Discs A3000/300/400/500/5000

50 Mb	£389.00
100 Mb	£539.00
200 Mb	£825.00

Elite External Hard Discs A3000/300/400/500/5000

50 Mb	£489.00
100 Mb	£639.00
200 Mb	£925.00
300 Mb	£1345.00
680 Mb	£1795.00

Worra Tape Streamer

60 Mb	£595.00
150 Mb	£795.00

High Speed Tape Streamer

60 Mb	£765.00
150 Mb	£895.00

Elite Tape Streamer (DAT)

1 Gb	£1750.00
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Magneto Optical R/W Drive

560 Mb	£3650.00
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This advertisement could not hope to mention in detail all the SCSI products we manufacture, so for further details please write or telephone.



COMPATIBILITY

PERFORMANCE



STAR LETTER £15

I would like to make a suggestion to all hardware and software publishers. I have used a variety of Acorn computers, from the Electron, through the Model B and Master to the BBC A3000. Overall I have found that Acorn has been pretty good in its documentation, as have most third parties. My suggestion is not about the actual text, but the way it is presented.

It seems that there is no standard style in which information is published. Also some software is published in cardboard 'books' which fall apart easily, and in thin cardboard boxes which have no strength at all, leading to a messy shelf.

It appears that a lot of Acorn-related merchandise is purchased through mail order, so eye-catching packaging is not really necessary. Why not adopt the simple idea that many computer companies have of using a loose-leaf binder? Computer Concepts DTP package, *Impression*, uses one. Any upgrades to software would only need a few pages, or a file for printing, rather than a new book, or some hastily printed sheets.

Since most DTP software supports various page sizes and formats, it is quite feasible that Public Domain and less expensive software instructions can be provided as text files, which could be printed out if desired. Already a lot of PD software is only documented on disc.

While such a system may not be immediately implemented, I hope publishers think about what they are producing.

Richard Brookes
Dunvant
Swansea

The packaging supplied with *Impression* is perhaps the best example of an updatable manual, although CC does not keep this standard throughout their range. The ideal situation would be for all software to be supplied in a standard box – The Fourth Dimension uses a multi-purpose box for all of its games.



The Train Game – a classic Beep program which we transferred to the Arc

The problem with having the entire tutorial on the disc is that unfamiliar users may not know where to start. Many prefer to read the instructions first.

MODULE MADNESS

As suggested in the article *Hard N' Easy* (BAU March 92), a quick way to update the modules in the System directory in the absence of Sysmerge is to select Full Info from the directory viewer and look at the date stamps of each module. But this method can be hit-and-miss if someone has re-stamped the file with a different date to that of the version date of the module, as I have found out the hard way. I believe Sysmerge also looks at the date stamps – if this is so, then surely it must be used with caution?

The only way to ensure you have the latest modules is to load each one and type *!help Modules* from the command line, and then have a look at the version number and date. I keep a text file called *Versions* in my System directory and every time I get a new module I load it and compare it with my version file.

David Madge
London

VIEW TO A KILL

I use *View* quite a lot and I find your Printer Driver Generator extremely useful for my BBC Model B and printer. To increase presentation even further, are there any extensions that can be made to the pro-

gram so that it can support micro spacing? I would greatly appreciate it if you tell me if this is possible.

Also, what has happened to your series on classic Beep programs, *Pieces of Eight*? That was one of the main reasons I purchased the magazine, and I was surprised when the February and March editions did not include it. When is it coming back?

R Keeble
Epsom
Surrey

We felt that *Pieces of Eight* had served its purpose of revisiting the best eight-bit programs published in the BAU. But if anybody has a special request for a specific program, then let us know. But we would also be interested to hear if there are any programs that you would like to see updated or transferred to the Archimedes. Meanwhile, look out for a *Pieces of Eight* special on View printer drivers.

SECONDHAND HAPPY

I have a BBC A3000 with monitor and 2Mb of memory which I bought along with a monitor stand for £400. Although it was secondhand, it hasn't given me any problems so far.

On the other hand my friend bought an Amiga 500 base unit with a bit of bundled software and 512K of memory for the same price. He then spent another £250 on a monitor and another £65 on a second drive – most of his games were unplayable without one. He

would buy a printer, but is scared that it would be incompatible with his software.

So, the Amiga is great for games, but most of them come on two or more discs, take a long time to load and hog the whole machine. Archimedes games are usually fast loading, are desktop friendly in the main (sometimes even multi-tasking) and disc swaps can be kept to a minimum.

Looking at the graphics side of the Amiga, you do have a lot of colours, but these are only used in ray tracing. Incidentally, has anyone ever heard of outline fonts, or an easy-access version of Basic for the Amiga?

The arguments for the Arc are numerous. I would urge anybody thinking of buying a brand new Amiga to check out the secondhand Arc market before they part with their valuable cash.

A Ashby
Smithills
Bolton

Take a look at our free ads on p85 for secondhand equipment this month.

PRESSING ERROR

I would like to raise a point regarding the review of *ArcFS* and *Spark* (BAU February). This review gives the impression that *Spark* and *ArcFS* are public domain programs, or perhaps Shareware. They are not and I would not wish anybody to gain the idea that they are.

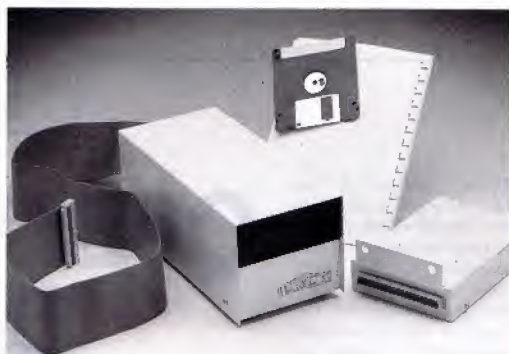
At the end of the review, while the correct information is given about *Compression*, for *ArcFS* it is simply stated that '*ArcFS*... is available from most public domain libraries'. As for *Spark*, there is just the statement: 'Anyone who uses bulletin boards or obtains software from PD libraries is probably familiar with an application called *Spark*'.

Spark and *ArcFS* are not Shareware. They are available from the address below, priced £5.99 each, including postage packaging and VAT.

David Pilling
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QUESTIONS AND ANSWERS

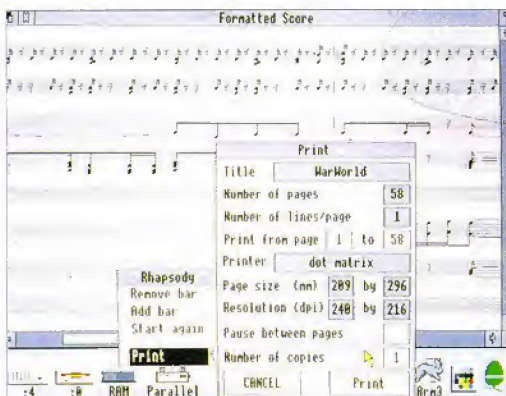
Q Paul Sandford of Sheffield wants to extend his knowledge of assembly language programming on his BBC B computer.

Having read Joe Telford's *BBC Micro Advanced Programming*, which covers many programming techniques not explained in the user guide, he would now like a more advanced book that covers topics such as interrupt handling and writing faster games in machine code.

A There are a number of good books available for the BBC computer, although you could find that many dealers don't hold much stock now, so you may have to hunt around. One to keep a look out for is *Cracking the Code* by Benni Notarianni. It is published by Pan (ISBN 0-330-28666-8) and explains many programming problems such as animated graphics, interrupts, writing maths routines in machine code and how to start writing games. It is aimed at the slightly more competent programmer, although does provide an easy to understand introduction to assembly code programming.

Q A common problem, aired by R Kendall of London is that of saving machine code programs so that they reload and execute at a specific memory location. He asks if there is a way of saving a portion of memory so that it loads at &900 automatically when you reload it.

A The answer to this question depends upon the syntax of the keyword 'SAVE' when you originally save the object code. Firstly, ensure that you compile your code to assemble at the address you want it to reload it. For example, to get your code to load at &900, set P% to &900 as you compile it and then use the command 'SAVE prog 900 A00 90A' which will save the portion of memory between 900 and A00, setting the execution address to &90A. When you load and run the program by



Rhapsody can be used to print out musical scores

typing 'RUN prog, it will automatically load at &900 and then jump to &90A and start executing the code.

Q Teacher, Susan Chapman from the Netherlands is trying to computerise her school library records using an Archimedes computer. She wonders if there is any suitable database software that will allow her to keep book titles, authors, classification numbers and topics, and to update them as required. Another primary consideration is easy use by young children.

A There are a growing number of databases available for the Archimedes range of computers, ranging from traditional style databases which consist of many 'record card' type entries to the more recent 'multi-media' style of database where the entry data can be of a variety of formats including pictures and data from other applications. For

your type of use I would recommend *Flexifile* by Minerva Software, (0392) 437756, which is reasonably easy to set up for the data you require. Once set up, young children and old can interrogate the data by using simple icons for forward, backwards and search commands, similar to those on a video recorder.

For more advanced use it will also allow you to create reports and search for entries when you do not know the exact spelling.

Q Problems are often encountered using the outline font system on the Archimedes. David Cooper of Glasgow asks if there is any way to load text into *Draw* with the aim of printing it out using a printer driver.

He repeatedly gets two error messages – either, 'Text area must end with a newline character' or, 'Warning: text area font Trinity.Medium could not be loaded'.

A The first error is reasonably easy to rectify and is usually caused by using *Edit* to compose the original text. When you finish typing your text in, remember to press RETURN at the end of the document, thus leaving a blank line at the bottom. When you subsequently load your saved text back into *Draw*, it will then know where the bottom of the text is.

The second error is caused by *Draw* not being able to find your fonts directory. *Draw* looks for Trinity.Medium by default so you should double click on *Fonts* before you load *Draw*.

Q A quick question next from Freddy Hutton of Oxon. He is currently using *Maestro* in order to compose music on his Archimedes A410/1 but wants to produce a hard copy of his composition on a printer. He asks if there is an application to enable him to do this.

A Your best option here is to upgrade to *Rhapsody* by Clares Micro Supplies, (0606) 48511, which is basically an enhanced version of *Maestro*. As such it will load your existing *Maestro* tunes and convert them to the new *Rhapsody* format. It not only contains support for Risc OS printer drivers, enabling you to print out your finished tune, but also has a host of additional features not supported by *Maestro*. For a professional output you can get an additional package called *ScoreDraw* which will produce printed results just like genuine manuscript sheet music.

Q Mr Baker of the West Midlands has just purchased an ATPL sideways Rom/Ram expansion board for his BBC B computer but unfortunately he didn't get any fitting instructions and is now at something of a loss.

A To fit the board, you will first need to remove the cover of your BBC and unplug the keyboard. Next

remove the OS Rom (IC51) and the A/D Converter (IC73, if fitted) and plug them both into the corresponding sockets on the ATPL board. Carefully remove the power connectors adjacent to IC32, bend them at 90 degrees and replace them. Next, remove the shorting link from the lower half of S21 and connect the two flying leads from the ATPL board to the vacant pins, ensuring that the wire marked E1 is to the right. Position the ATPL board pins directly over the empty sockets of IC51 and IC73 and carefully insert the board into the vacated sockets. The machine can now be re-assembled.

If you want to plug Ram chips into socket 15, you can connect a small switch between the contacts of S6, in order to give you a write protect facility.

Q One often voiced question concerns recovery of deleted files on Risc OS discs. Mr G Sheridan of Bedfordshire echoes many peoples' thoughts when he admits to accidentally deleting some files from his discs. He wants to know if there is any way of retrieving the lost data.

A Restoring deleted data can be an arduous task, even for the most experienced of users, so I would recommend a program to automate the task. *Look-Systems* (0603) 764114 have produced just such a utility, which will repair broken directories, restore disc errors and retrieve deleted files. It works on both hard and floppy discs and supports any filing system.

Q David Hartburn of Tyne & Wear has a problem with his Archimedes internal clock. He finds that it often forgets the time, despite resetting the machine and using *Alarm* to set the clock.

A This sounds like a symptom of a flat battery inside the computer. Have you noticed any of the

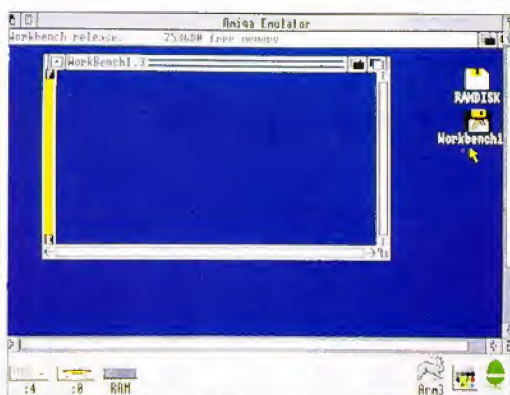
computers' other settings becoming corrupted or changed? It is a good policy to replace the Cmos Ram battery every year, as a weak battery can quite often give confusing or unpredictable results during use of your computer. If replacing the battery does not cure the fault, it is possible that you have a faulty clock chip inside the machine, which will need checking by an official dealer.

Q Another Archimedes disc error is often encountered by M. Dunkin of Lincoln. He reports getting a 'Filecore in Use' error from time to time when using a lot of discs such as DTP, Font and work discs. He asks if there is a simple solution to avoid this.

A Every time you click on a new disc, its name is added to a list of disc names currently held inside the computer. This is kept until you either turn off the machine or dismount the disc. Unfortunately, Risc OS has a limit, beyond which the 'Filecore in Use' error is generated. The easiest way to avoid this is to dismount discs as you finish using them. Just click the middle mouse button on the disc icon and select the 'dismount' option. It is good practice to remember this and also ensures that you don't have too many filer windows open on the screen.

Q Mrs Coop of Stroud is the proud new owner of a second hand Acorn Electron, and would like to buy some educational software for her seven year old daughter. However, Mrs Coop only has a cassette recorder and wonders if there is any software available on tape.

A You can quite often find cassette-based software at bargain computer shows, such as the All Formats Computer Fair that is held every few months at London's Horticultural Halls. However, MicroPower in Leeds still stock quite a few



Whoever heard of Amiga emulation on the Archimedes?

of their educational titles on tape format. You can phone then on (0532) 621111 for a catalogue.

Q A commonly asked question was that posed by D Green of Sunderland. Being a beginner, he asks how to save Basic programs, having just typed them in from listings such as the yellow pages.

A First, ensure that there is a tape or disc inserted and then, from the Basic prompt type *SAVE* prog and press RETURN. You can substitute your own program name for the word 'prog', but ensure that it is no longer than seven characters on the BBC or ten characters when using ADFS on the Archimedes.

When using discs, you can find out what is already on a disc by typing **CAT* from the Basic prompt. For Archi-

medes owners this has the same effect as clicking on the disc icon from the desktop.

Q W Calderbank from Bolton has an Archimedes computer armed with a few games but wonders if there is such a thing as an Amiga emulator in order to extend the range of games available.

A The Amiga has a very elaborate operating system which would be difficult to emulate with any amount of speed. However, this being the April issue, I was tempted to 'play along' with this one, but the last laugh may be on me, as I have heard that a couple of people are in fact working on one. Arxe systems, 081-534 1198, are actively working on Spectrum and Atari emulators but admit that an Amiga one may be a little bit tricky. Still, you never know!

HELP US TO HELP YOU

The Questions and Answers page is your chance to have your problems solved. It can be on any topic - you name it and we'll try to solve it. Please send your questions, whether technical or otherwise, to:

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We are happy to answer your queries on these pages, but regret that we are unable to send personal replies to questions sent in. If you send a disc, please put your name and address on the disc itself. It is also useful if you could include full details of your machine. Please enclose an SAE where necessary and mark on your envelope whether you use a BBC eight-bit micro or 32-bit Acorn A3000/A5000/Archimedes/A5000.

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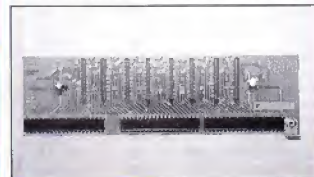
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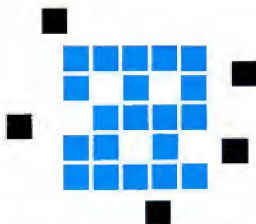
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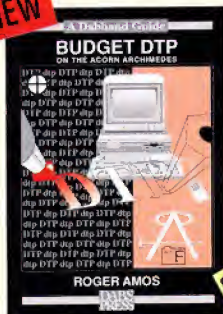
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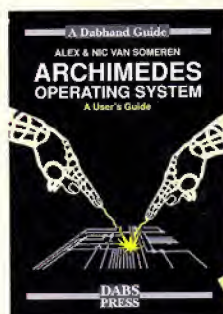
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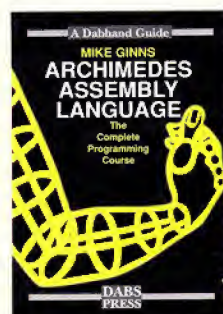
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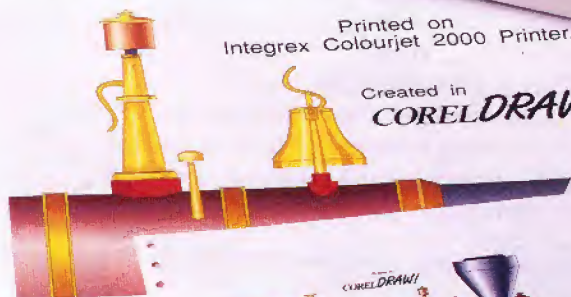
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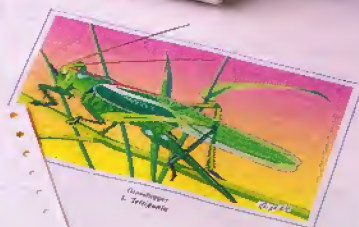
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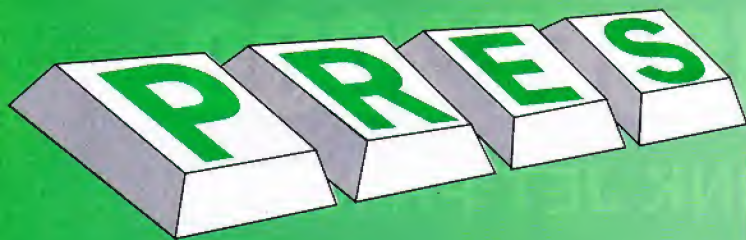


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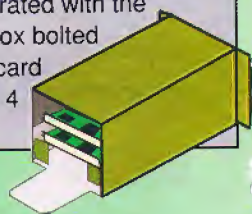
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• R312-A305/310 - to 2MB RAM Upgrade	£149
• R314-A305/310 - to 4MB RAM Upgrade	£265
• R412-A410/1 - to 2MB RAM Upgrade	£30
• R413-A420/1 - to 4MB RAM Upgrade	£60
• R414-A410/1 - to 4MB RAM Upgrade	£90
• R810-A410/1 - to 8MB RAM Upgrade	£599
• R820-A420/1 - to 8MB RAM Upgrade	£569
• R840-A440/1 - to 8MB RAM Upgrade	£499
• R814-R140 - to 8MB RAM Upgrade	£499
• A5000 - to 2MB additional RAM Upgrade	£123

**0% Finance & Special
Teachers/Academics' prices
Now available on A3000/LC
and A5000 L/C Micro Systems**

Convert your Archi 410 to a 420 or 440 with Watford's unique Upgrade Kits

UP10 - to 2MB RAM + 20MB Hard Disc	£159
UP15 - to 2MB RAM + 40MB Hard Disc	£245
UP20 - to 4MB RAM + 20MB Hard Disc	£225
UP30 - to 4MB RAM + 40MB Hard Disc	£309
UP40 - to 4MB RAM + 53MB Hard Disc	£429

Graphics, Art, Design & Games

GRAPHICS		Pysanki	£14
ARCTist	£19	Quazer	£10
ARCTiculate	£19	Real McCoy	£22
Atelier	£65	Real McCoy 2	£23
Artisan II	£45	Redshift	£14
Artisan Gallery	£16	Return to Doom	£16
Autosketch II	£65	Revelation	£54
Craftshop 1 & 2	£28	Repton 3	£14
Euclid 2	£50	Rotor	£19
Graph Box	£59	Saloons Cars	£18
Graphbox Professional	£107	Splice	£25
HotLink Presenter	£40	Sporting Triangles	£24
Kermi	£46	Star Trader	£14
Mogul	£17	Superior Golf	£14
Poster	£79	Super Pool	£19
Pro Artisan	£70	Swin	£22
Prime Art	£69	Talisman	£12
Render Bender 2	£95	The Pawn	£19
Snippet	£21	Thundermonk	£11
Tween	£21	Timewatch	£24
		Trivial Pursuit	£22
		Twin World	£15
GAMES		U.I.M.	£23
Air Supremacy	£14	White Magic	£15
Apocalypse	£14	White Magic 2	£15
Archie Soccer	£14	Wimp Game	£13
Avante Garde Fonts	£23	Worldscape	£16
Boogie Buggy	£18	XFire	£18
Break 147	£18		
Bug Hunter	£13		
Caverns	£13		
Chess 3D	£14		
Chocks Away 2	£14		
Chocks Away Extra	£14		
Conqueror	£15		
Cops	£14		
Corruption	£18		
Crisis	£21		
Elite	£33		
Enter the Realms	£19		
Enthar Seven	£21		
E-Type	£14		
E-Type Designer	£13		
Family Favourites	£13		
Fireball 2	£19		
Holed Out Designer	£13		
Holed Out Golf	£13		
Hostages	£14		
Ibix the Viking	£13		
Inter Dictor 2	£26		
Iron Lord	£15		
Jiglet	£25		
Jigsaw	£27		
Lemmings	£20		
Masterbreak	£16		
Magpie	£39		
Man at Arms	£14		
MahJong Patience	£15		
Manchester United	£15		
Europe	£19		
Nevryon	£14		
Olympics	£14		
Pandoras Box	£18		
Pipe Mania	£17		
Pirate	£16		
Power Band	£14		
Punoman 1 & 2	£16		
Punoman 3 & 4	£16		

Miscellaneous

Chess 3D	£14	Ancestry	£59
Chocks Away 2	£14	Accomm 2	£38
Chocks Away Extra	£14	Aicterm 7	£64
Conqueror	£15	Armadae Sound	£60
Cops	£14	BBC DFS Reader	£6
Corruption	£18	Blowpipe	£17
Crisis	£21	Broadcaster Loader	£55
Elite	£33	Compression (CC)	£38
Enter the Realms	£19	Equisor	£37
Enthar Seven	£21	FlexiFile	£98
E-Type	£14	Genesis Plus	£68
E-Type Designer	£13	Genesis 2	£99
Family Favourites	£13	Hearsay Comms	£38
Fireball 2	£19	Pack	£50
Holed Out Designer	£13	Investigator 2	£22
Holed Out Golf	£13	JX Archi Colour Printer	
Hostages	£14	Driver for Citizen &	
Ibix the Viking	£13	Star Printers	£15
Inter Dictor 2	£26	Notate	£52
Iron Lord	£15	Numerator	£66
Jiglet	£25	Pin Point	£65
Jigsaw	£27	Presenter 2	£29
Lemmings	£20	Presenter Story	£145
Masterbreak	£16	QUEM 386	£59
Magpie	£39	Rainforest	£17
Man at Arms	£14	Revelation 2	£95
MahJong Patience	£15	Rhapsody in Blue 2	£45
Manchester United	£15	Show Page	£127
Europe	£19	Speech!	£15
Nevryon	£14	The Victorian	£17
Olympics	£14	Time Tabler	£549
Pandoras Box	£18	Toolkit (Claris)	£35
Pipe Mania	£17	Touchtype	£40
Pirate	£16	Tracer	£46
Power Band	£14	Tracker	£39
Punoman 1 & 2	£16	Vox Box	£47
Punoman 3 & 4	£16	Worldscape	£17

Archimedes Hard Disc

Watford's ST506 Hard Disc drives for A310 & A410 series fit internally into the space provided.
P.S. A310 upgrades require a backplane and a fan.

• 3HDP - Hard Disc Podule only	£135
• 3HD20 - 20Meg H' Disc + Podule for 310	£235
• 3HD40 - 40Meg H' Disc + Podule for 310	£345
• 3HD50 - 53Meg H' Disc + Podule for 310	£474
• 4HD20 - 20Meg Hard Disc for 410	£129
• 4HD40 - 40Meg Hard Disc for 410	£215
• 4HD50 - 53Meg Hard Disc for 410	£335
• A3000 20Meg Hard Disc + Podule	£299
• A3000 40Meg Hard Disc + Podule	£429

For Archimedes IDE Hard Disc turn to page 14

Desk Top Publisher

Acorn's Archi DTP Package	£108
Equasor	£39
Impression 2 DTP Pack	£125
Impression Junior	£69
Impression Business Supplement	£39
Expression-PS	£19
Tempest DTP Package	£90

Archi Wordprocessors

Pendown Archi	£48	1st Word Plus - 2	£63
Pendown Outline		Archie Spell Master	£25
Fonts	£18	PD Spellchecker	£40
Wordwise + Disc	£24	Graphic Writer	£19
Image Writer	£25	EasiWord	£18
Interword Disc	£24		

Databases

AlphaBase	£36	Magpie	£40
Knowledge Organiser	£42	Multistore v2.01	£176

Spreadsheets

Intersheet Disc	£24	Schema	£89
Viewsheets	£45		

Business Graphics

GammaPlot	£39	Sigmaplot	£39
Interchart Disc	£17		

Integrated Packages

- Logistix £79 • Pipedream 4 £149
- Desktop Office - Database, Graphs & Charts, Wordprocessor Spreadsheet, Communications £98
- Desktop Folio - Wordprocessor, Desktop & Interactive Publishing. Ideal for school environment. £75

A3000 I/O Card (User, Analogue & IIC)

This NEW versatile I/O Card from Watford, fits inside the A3000 and includes an Analog to Digital Converter, a User Port, and an InterIC (IIC) connector.

The card allows many of the peripherals developed for the BBC to be used with the Archimedes A3000. The ADC and User Port have the same pin out and connectors as the BBC computers.

Extensive RISC OS software is supplied to provide BBC OSBYTE calls for support of the ADC and User Ports, including the BASIC keyword ADVAIL. The software provides extended RISC OS support for separate interrupts from both the ADC and User Ports, permitting easy interrupt driven operation.

The card is provided with all the software in ROM and is automatically loaded when the machine is turned on.

Peripherals connected to the ports can obtain up to 500mA of power at +5V. A fuse is fitted to the card to protect the A3000 from damage arising from accidental short circuit of the power output.

The card is provided with an extensive manual explaining installation, all software commands, connector pin outs, hardware addresses and example programs.

Features

- An 8 bit User Port with a standard 20 way IDC connector, compatible with the User Port on the BBC computers and the Archimedes I/O Podule.
- A 10 bit Analog to Digital Converter with a standard 15 way D type connector, compatible with the ADC on the BBC range of computers and the Archimedes I/O podule.
- An InterIC (IIC) Port with a 5 pin DIN socket to connect the A3000 to external IIC devices.

£42

Archi Mouse Port Splitter

Our handy little splitter unit eliminates the risk of damaging your micro due to constant plugging and unplugging of the mouse by allowing you to connect both, a joystick and a mouse simultaneously to your Archimedes.

£15

Silicon Vision

Gerber Plot	£95	Solids Render	£120
Solid CAD	£120	Solid Tools	£279
Super Plot	£28	Data Vision	£110
Super Dump	£22	Share Holder	£135
Arc PCB Professional			£275
Realtime Solids Modeller			£136

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version

Only £15

Archimedes External Disc Drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Up to 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead.
• A300/A3000 £21 • A400 £25

More Archimedes Products See Pages 3, 5, 6, 8, 10, 14

LANGUAGES (Archimedes)

ISO-PASCAL; FORTRAN 77	£77 each
Assembler; LISP; Prolog X	£149 each
ANSI C Rel. 3	£125
BASIC Compiler	£77
Cambridge Pascal	£60
Logotron Logo	£45
Macro Assembler	£40
Risc Basic	£120
Robo Logo	£69
Risc FORTH	£110

NEW 256 Grey-Scale Scanner

Watford proudly introduces its new innovative 256 grey-level hand scanner for the Archimedes range of micros. It offers up to 400 dpi scanning resolution, complete with software.

256 Grey-Scale Scanner is ideal for incorporating pre-drawn logos, artwork, photographs and sketches into desktop publishing documents and other graphics programs. Designed by our own R & D team, it offers the best overall scanning solution for Archimedes micro. Just compare the competition on our price and these outstanding features:

- Full 105mm 400dpi scanning operation in just 3ms per line! (Twice as fast as most scanners.)
- Selectable 256/16/4 grey levels
- Full scan preview, scale to fit windows
- Complete set of image enhancement tools
- Single width podule
- True brightness and contrast control
- Fast RISC OS printing
- Five-function edge detection software, Laplace convolution matrix image enhancement, image smoothing, etc.

Special Launch Price

£185

ULTIMUM - Archimedes A3000 Podule Racking System



THE ONLY LOGICAL WAY TO
EXPAND YOUR A3000 COMPUTER

Price: £149

Minerva's Archimedes Software

EasyWord	£18	Mailshot*	£27
Home Accounts	£35	Reporter*	£27
Time Tabler	£549	School Admin*	£65
System Delta	£59		

System Delta Program Reference Manual £29

* Requires System Delta to operate

Stand alone Business Accounts Packages

Sales; Purchase; Order Processing and Invoicing;
Nominal; Stock management

£79 per module

or Complete Business Package £325

ARM 3 Turbo Card

Simply The Best



Here it is at last - the all new Mark 2 version of Watford's highly acclaimed ARM 3 processor board for the Archimedes and now also the A3000 series computers. Using the latest surface mount technology on a high quality four layer circuit board we have reduced the overall size to a mere 53mm x 45mm, and the cost to only £199. Mk II upgrade will increase the speed of your micro by a factor of 3 to 6.

Any competent A300 or A400/1 series micro owner can fit the upgrade himself, as we provide full fitting instructions and a special ARM chip extraction tool. However for A3000 micros and those not wishing to perform the upgrade themselves, we will collect, upgrade and return your micro by courier service, at an additional cost of £18.
(A300 and old A440 series owners please note - you will need to upgrade to MEMC1A for ARM3 to work.)

RRP £249

Offer Price £185

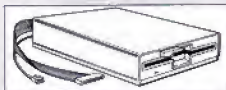
Acorn have satisfactorily evaluated Watford's ARM 3 upgrade and the A3000 upgrades are fitted by Acorn approved surface mount technology centre, therefore its fitment will not invalidate Acorn's warranty on the micro.

Continued → → → → → → → →

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£399**

FREE OFFER



A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

Gemini's OFFICE MATE & OFFICE MASTER packages on disc consisting of: Database, Spreadsheet, Beebplot graphics, Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control.

FREE with every BBC Master purchased from us during March

Add-Ons & Accessories

Econet Module for the Master	£45
Twin ROM Cartridge for Master	£9
Quad ROM Cartridge for Master	£14
Master Reference Manual I	(No VAT) £14
Master Reference Manual II	(No VAT) £14
Master Advance Ref Manual	(No VAT) £17
64K Upgrade Kit for B+	£32
Acorn 1772 DFS Kit complete	£49
ECONET Upgrade Kit for BBC B	£42
ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238
Morley Teletext Adaptor with AT5 Rom	£99
Ecolink	£270

Z88 Portable Micro



£179

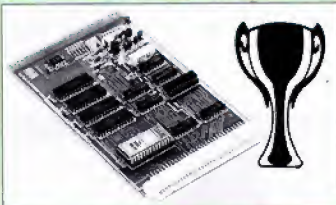
FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

Z88 ACCESSORIES

• 32K RAM Pack or 32K EPROM Pack	£16
• 128K RAM Pack or 128K EPROM Pack	£32
• 512K RAM Pack	£86
• Z88 Eprom Eraser Unit	£38
• Z88 Spellmaster for Pipedream	£40
• Z88 Carrying Case	£8
• Z88 Computing Book	£9.95
• AA Nicad Rechargeable Battery	£1.50
• Battery Charger Compact & Fast	£6
• Z88 Serial Printer Cable	£8
• Z88 Parallel Printer Cable	£18
• Z88 to Archi Link	£15
• Z88 to BBC Link	£8
• Z88 to PC Link II	£27
• Z88 to Macintosh	£32
• Z88 Mains Adaptor	£9
• Z88 Modem	£114
• Z BASE	£56
• Z TAPE	£42
• Z TERM	£42

Archi Real-Time Digitiser



Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £139

A Set of Colour Filters for colour image grabbing using a video camera **£16**

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic for use in Education).
(FREE this month, PC Mouse Drivers & Art package)

Special Price £175

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra £15

Archi Graphic Tablet Junior. Working area 9" x 6". Price includes Stylus £110

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

• Watford sophisticated DFS ROM	£16.00
• Watford DFS Kit complete	£69.00
• We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
• DFS Manual (comprehensive)	£6.95
• Acorn DNFS ROM	£17.00
• Acorn ADFS ROM only	£25.00
• Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DFSs).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DFSs and Acorn ADFS together. Now our Mk II DFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

- Added features include:
- Acorn ADFS compatible - Use ADFS on our DFS board.
 - Tube host Code - No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
 - Auto 40-80 Track sensing - no need to fuss with 40/80 track switches (even works with protected disks).
 - An extremely powerful 8271 emulation - ensuring compatibility with almost all software.
 - New low profile - small footprint board.
 - Fits with all third party ROM boards.
 - Option to double the speed of file handling operations - BPUT and BGET.
 - Operates in both single and double density modes.
 - OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DFSs are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk - Ours allows both of these!

If you already have a DFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DFS board and we will supply the new DFS for only **£39.00**.

- SPECIAL PRICE **£44.00**
- DFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DFS for only **£30.00**

Please note, as the MkII DFS is a hardware and software upgrade, it is not possible for existing Watford DFS users to simply exchange the ROM for the new version.



3M - Diskettes

3M - SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor

• 10 x 5.25" S/S D/D 40T (744)	£5
• 10 x 5.25" D/S D/D 40T (745)	£5
• 10 x 5.25" S/S D/D 80 Track (746)	£7
• 10 x 5.25" D/S D/D 80 Track (747)	£7
• 10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT	£9
• 10 x 3.5" S/S D/D 40/80 Track	£7
• 10 x 3.5" D/S D/D 40/80 Track	£7
• 10 x 3.5" Double Sided High Density	£13



Top Quality 3.5" & 5.25" Diskettes

To complement our range of Quality Discs and Disc Drives. We are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

• 10 x M3 3.5" D/S D/D 80 Track	£7
• 10 x M9 3.5" D/S High Density	£12
• 10 x M4 5.25" S/S D/D 40 Track	£5
• 10 x M5 5.25" D/S D/D 40 Track	£5
• 10 x M7 5.25" D/S D/D 80 Track	£7
• 10 x M8 5.25" D/S D/D Hi-Density	£9
• M2 3" Double Sided	£2.50 each



**CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 250234 or 233383**

Quality Disc Drives from Watford

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. All 5.25" Disc Drives are 40/80 track switchable. For ease of use, the switches are front mounted.

Various UK "manufacturers" of disc drives for the BBC Micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

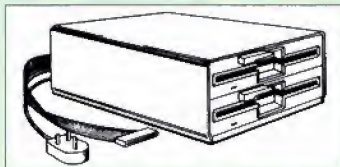
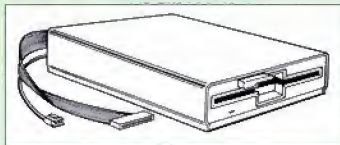
If you look around the popular BBC Micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. **Ideal for Schools & Colleges.**

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space. Your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double Plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 6th page of our advert for the Plinths).

P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is our special Compact Disc Drive cables designed by us.

"Test Bureau Approved for Use in Education"



Our Disc Drives conform to BS415

Type	Description	
Disc Drive without PSU		
• CLS400S:	Single, 40/80 track 400K Double sided Drive	£70
• CLD800S:	Twin, 40/80 track, 800K Double sided Drives	£138
Disc Drive with PSU		
• CS400S:	Single, 40/80 track, 400K Double sided Drive	£80
• CD800S:	Twin, 40/80 track, 800K Double sided Drives	£153

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

3.5" DISC DRIVE



These top quality 3.5" Double sided, 80 track, are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Type	Description	
Disc Drive without PSU		
• CLS35:	Single Disc Drive, 400K	£62
• CLD400S:	Twin Disc Drives, 800K	£109
Disc Drive with PSU		
• CS35:	Single Disc Drive, 400K	£83
• CD35:	Twin Disc Drives, 800K	£126

(P.S. CS35 is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage)

Disc Drive Sharer



(Ideal for educational establishments)

A low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC Micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Price includes 3 Cables **£55**

Disc Drives in Monitor Stand



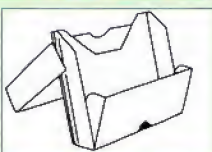
• **CDPM 800S** – Twin 5.25", 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC B & Master 128K micros. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

£165

• **DP35 800** – Same as above except, one disc drive is a 5.25" and the other is 3.5".

£154

Plastic Library Cases



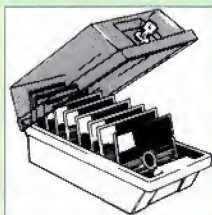
• DCL1 – Holds 5 x 3.5" Discs.	£1.50
• DCL2 – Holds 10 x 3.5" Discs.	£1.90
• DCL3 – Holds 5 x 5.25" Discs.	£1.60
• DCL4 – Holds 10 x 5.25" Discs.	£2.00

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of Cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Antistatic Lockable Disc Storage Units



Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

• M35 – holds up to 50 5.25" discs	£4.95
• M85 – holds up to 95 5.25" discs	£6.95
• M25* – holds up to 25 3.5" discs	£4.95
• M50 – holds 50 3.5" discs	£6.50
• M100 – holds 100 3.5" discs	£6.99
• M10 – holds 8 of No. 10 Data Cartridges	£15

* Not lockable

Dust Covers (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

Disc Albums

Attractively finished leather-look Vinyl. PVC Vinyl.	
DW1 – Holds 6 x 3.5" Discs	£2.50
DW2 – Holds 6 x 5.25" Discs	£3.00
DW3 – Holds 20 x 5.25" Discs	£3.50
DW4 – Holds 40 x 3.5" Discs or 5.25" Discs	£4.50

Special Bulk Offer on Discs

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)



PRICES SLASHED

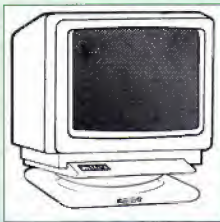
BULK PACK DISCS in lots of 100

Type	S/S	D/S	D/S
	40T	40T	80T
• Without Sleeves 5.25"	£30	£35	£40
• With Sleeves 5.25"	£33	£38	£43
• 3.5" D/S D/D	£27 for 50	£49 for 100	



CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 250234 or 233383

Continued → → → → → → → →



Microvitec Monitors

- 1431 - Standard Resolution Monitor £169
- 1451 - Medium Resolution Monitor £209
- Cub3000 Medium Res for A3000 £189
- 1441 - High Resolution Monitor £359
- Dust Cover for Microvitecs £5.50
- Touchtec 501 Touch Screen £239

Now 3 years Parts & Labour warranty on all Microvitec Monitors

Multiscan Colour

- Elizo 9060S £389
- NEC 6FG £1525
- Elizo 9070S £579
- Taxan 770LR £362
- NEC 3FG £370
- Taxan 775 £362
- NEC 4FG £465
- Taxan 795 £402
- NEC 5FG £850
- Taxan 875 £685
- VIDO Enhancer Board £25

(We will supply the Watford's superior Multiscan VIDO Enhancer for Archimedes micro at only £10, if purchased with any Elizo or Taxan monitor.)

(P.S. Taxan 795 monitor is supplied with a FREE VIDO enhancer board)

Aries AlphaScan Monitor

Pound for Pound, the AlphaScan VGA Multiscan monitor provides the maximum performance and greatest flexibility of any 14" colour monitor for the Archimedes micro.

Its multiscan circuitry provides automatic adjustment for frequencies between 30 and 60KHz horizontal, and 50 and 90Hz vertical. Its 0.28mm dot pitch high resolution tube provides super sharp text graphics, while a high speed (70/72Hz) refresh rate provides a flicker-free display easing the eye strain. The Multivideo VIDO Adaptor supplied (free) with the monitor allows high resolution operation in all screen modes.

£325

Philips Monitors

- BM7502 12" Hi-res Green Monitor £67
- CM8833 14" Med. Res Colour Monitor £167
- Dust Cover for Philips Monitors £6

STAR BUY

- PHILIPS 14" Medium Res, dark glass, attractively finished Colour Monitor. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £166

Spare Monitor Leads

- BNC Lead for Zenith or Philips £3
- Skart Monitor Lead £5
- RGB lead for TAXAN Monitors £3
- Archimedes Colour Monitor Lead £7.50

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

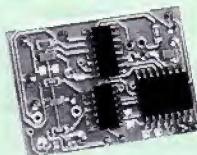
£12

Aries 2000 Colour Monitor

This attractively finished, etched screen medium res monitor is supplied complete with built-in speaker, volume control and video output. All controls are located on the front panel for ease of use. Ideal for BBC, BBC Master, Archimedes and Amiga.

A bargain at £159

Watford VIDO Enhancer



This unique VIDO add-on board for the Archimedes, caters for all types of Multiscan and VGA monitor and mode requirements. There are 2 versions to suit all requirements. The multimode software supplied, provides all the new modes for the selected monitor type, including the now standard Computer Concepts modes. With VGA monitor, you are no longer restricted to a few modes. A WIMP application supplied on disc, allows new modes to be designed and existing modes to be modified for particular monitors.

Super VGA VIDO Card: This provides support for both VGA and Multiscan monitors. A unique electronic design allows the horizontal and vertical sync to be buffered and have the polarity changed under software control

£45

Multivideo VIDO Card: As above but for MultiScan monitors only.

£25

Panasonic Printers



- KX-P1123 £129
- KX-P1654 *£335
- KX-P1124i £173
- KX-P1695 *£272
- KX-P1170 £100
- KX-P2624 *£295
- KX-P1624 £272
- KX-P2180 *£295

* Price includes 12 months On-site warranty

Cut Sheet Feeders

- P36 - 1124/24i £79
- P37 - 1123/70/80 £69
- P38 - P1624/95; P2624 £129

Buffers

- P12 4K Buffer Board for KX-P1081 £55
- P14 32K Buffer P1123/24/70/80 £16
- P1540/92/95; P1624/54/95

Serial Interfaces

- P19 for P1123/24/24i/70/80/1624/54/95/2624 £49

Citizen Printers

- 120D Plus £100
- Swift 9 £129
- 124D £145
- Swift 24E# £249
- 224 £185
- Swift 24X £299
- PN-48 £209
- PN48 Ribbon £4

FREE Colour Option with Swift 24E

- Swift 9 Colour Option £19
- Swift 24 Colour Option £29
- Swift 24 Ribbons Black £4
- Citizen/Archimedes Colour Printer Driver £15

Integrex Colour Jet

- Colour Jet 132 Printer £449
- Paper Roll £6.50
- BBC Screen Dump Software £10
- Colour Cartridge £21
- Black Cartridge £12.40
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123
- Colour Jet 2000 £204

Star Printers

- LC15 £173
- SJ48 Inkjet £174
- LC20 £100
- XB24-200 Colour £295
- LC24-10 £133
- XB24-250 Colour £355
- LC24-15 £240
- XB24 Colour kit £29
- LC24-200 £164
- ZA200 Colour £234
- LC24-200 Colour £203
- ZA250 £297
- LC200 Colour £143
- Star/Archimedes Colour Printer Driver £15

Star Accessories

Cut Sheet Feeder

- LC10/200/24-10 £65
- LC15/LC24-15 £125
- XB24-10 £80
- XB24-15 £139

Serial Interfaces

- 8K Ser LC-200; LC24-200; FR10; FR15; £52
- XB24-10; XB24-15

Paper Roll Holders

- LC-200; LC24-200; LC24-200 colour £29

Buffers

- 32K Ram Card for LC/XB24-10; 15; LC200 £55

Ribbons

- LC10; LC10-II; LC15 Black £4; Colour £6
- LC-200; LC24-200 Black £5; Colour £12
- XB24-10; XB24-15 Black £5; Colour £12

Laser Printers

All Laser Printers include 12 months On-site maintenance

- Canon LBP-4+ 4ppm £575
- Canon LBP-8 III 8ppm £970
- Canon LBP-8 IIIR 8ppm £1440
- Canon LBP-8 IIIT 8ppm £1340
- Epson EPL4100 6ppm £620
- Epson EPL7500 6ppm £1159
- Epson EPL8100 6ppm £965
- HP Laserjet IIP+ 8ppm £625
- HP Laserjet III 8ppm £1015
- HP Laserjet IIID 8ppm £1499
- HP Laserjet IIIP 4ppm £695
- HP Laserjet IIISI 16ppm £2525
- Panasonic KX-P4420 8ppm* £620
- Panasonic KX-P4450i* 11ppm* £925
- Panasonic KX-4455 Postscript 11ppm* £1450
- Panasonic KX-P4430 Satin Print* £999
- Star LP-8 III 2 8ppm £1249
- Star LP-8 III 8ppm £910
- Star LP-8 Star(post)script 8ppm £1140
- Star LP-4 4ppm £565
- Star LP-4PS Postscript 4ppm £779

* Now with 2 years On-site warranty

Laser Toners

- Canon 2, 3 & 4 £46
- KX-P4420/50 £19
- Epson GQ £13
- Laserjet HP IIP & IIIP £42
- EPL 4100 £59
- Laserjet II/D, III/D £48
- EPL7100 £82
- Qume Crystal (3) £58
- Star LP-8 £56

Laser RAM Upgrades

- IIP & III 1MB £51
- EPL7100 256K £39
- IIP & III 2MB £88
- GQ5000 512K £42
- II & IIID 1MB £54
- KX4420/50 1M £75
- II & IIID 2MB £99
- KX4420/50 2M £115
- II & IIID 4MB £146
- KX4420/50 4M £135
- Canon LBP4 1M £105
- Star LP8 1M £199
- Canon LBP8 2M £125
- Star LP8 2M £275

Laser Drum & Developer

- Epson Drum GQ5000 £93
- EPL7100 £129
- Panasonic 4420 Drum £60
- Developer £59
- Panasonic 4450 Drum £93
- Developer £80
- Qume Drum £76
- Developer £56

Jetpage Postscript Cartridge

- HP IIP/III £225
- IID & IIID £227

Various Add-Ons

- Laserjet Appletalk Interface £135
- HP Adobe Postscript £399
- Pacific Page Postscript £259
- HP Premier Font Collection £28
- Laserjet various Font cartridges from £45

Hewlett-Packard Printers

• Desk Jet 500	£285	• Paintjet XL	£1045
• Desk Jet 500 Col.	£475	• Quiet Jet Plus	£384
• Paint Jet Colour	£430	• HP Think Jet	£265
# Now 3 years extended Parts & Labour warranty			
• DeskJet 500 Cart. Black	£15;	Colour	£27
• Paintjet Cartridges Black	£19;	Colour	£25
• Desk Jet 500 256K RAM cartridge			£99
• HP Epson FX Emulation Cartridge for Desk Jet			£59
• Desk Jet Unlimited (Book No VAT)			£19.75

Canon Bubblejet Printers

Printer	CSF	D'ble Bin	Ink Cart
BJ10EX	£183	£43	£16
BJ300	£289	£88	£12
BJ330	£380	£110	£12
BJC800C	£1549		
• Spare Battery pack for BJ10E			£33

NEC Pinwriter Printers

• P20	£180	• P70	£419
• P30	£240	• P90	£635
• P60	£330		
• P60/70 Colour Option Kit			£59
• Ribbons Black for P20/30	£6	for P60/70/90	£7
• Ribbons for P60/70/90 Black	£9	Colour	£13.50
Cut Sheet Feeders			
P20	£59;	P30	£85;
P60	£89;	P70/90	£80

Epson Printers

DFX5000	£1079	LQ1080 Colour	£595
DFX8000	£1979	LQ1070	£315
FX850	£264	LQ1170	£437
FX1050	£336	LQ2550+	£675
LQ100	£159	LX400	£101
LQ200	£162	LX850+	£140
LQ450	£165	LX1050	£206
LQ570	£205	SQ850	£432
LQ860 Colour	£444	SQ2550	£625
LQ870	£368		

Cut Sheet Feeders for

LX400/800/850/LQ400/500/550	£69
EX800/FX800/850/LQ800/850	£130
FX/LQ 1000/1050/SQ850	£159
LQ 2550	£390
SQ2550	£390

Tractor Feed for

LQ800 £44; LQ850/FX850 £69; LQ1050/
FX1050 £85; LQ2500 £90; LQ2550 £90.

Accessories

• EX800/1000 Colour Option	£45
• EX800/1000 Colour Ribbon	£14
• LQ2500 Colour Option	£65
• Multifont Card for LQ550/850/1050	£95

Epson Printer Interfaces

All these interfaces fit inside the printer

RS232	£28	RS232 + 2K Buffer	£52
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Printer Leads

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Nimbus Centronics Lead	£6
IBM/Archimedes Parallel Lead 6'	£4
IBM/Archimedes Parallel Lead 5 metres	£10
IBM/Archimedes Parallel Lead 10 metres	£15
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.
IBM Keyboard extension lead coiled	£5

Concept Keyboards

Standard A3 Keyboard with BBC Software	£138
Standard A4 Keyboard with BBC Software	£109
Archi A3 Keyboard	£139
Archi A4 Keyboard	£110

Plotters

• HP7440AU	£525	• HP7475AU	£715
Roland Plotters			
• DXY1100	£490	• DXY1200	£620
• DXY1300	£825	• DXY2500	£2345
• DXY3500	£2955	• Sketchmate	£310
• Roland plotter Pens, Fibre tip			£7.50

Listing Paper (Perforated)

• 1,000 Sheets 9.5" x 11" Fanfold Paper	£7
• 2,000 Sheets 9.5" x 11" Fanfold Paper	£11
• 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold	£21
• 1,000 Sheets 15" x 11" Fanfold Paper	£9
• 2,000 Sheets 15" x 11" Fanfold Paper	£16
• 1,000 Sheets true A4 Fanfold Paper 70gms	£11
• 2,000 Sheets true A4 Fanfold Paper 70gms	£21
• Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

Printer Labels

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£6.00
1,000 90 x 36mm (Twin Row)	£6.25
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.75

Laser Printer Labels on A4 Sheets

3750 70 x 29mm (3 Rows)	£13.50
3000 70 x 37mm (3 Rows)	£13.25
2625 70 x 42mm (3 Rows)	£13.00

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
BBC Micro	—	£3.50
BBC Master	—	£4.00
Archimedes Micro pair	—	£9.00
Citizen 120D	£2.75	£4.50
DMP2000	£2.75	£4.75
DMP4000	£3.75	£4.85
EX800/1000	£3.50	£5.00
RX/FX80/85/800/MX80	£2.95	—
FX/MX/RX100/1000	£3.95	—
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£3.25	£6.00
LQ1050/LQ2500	£4.00	
LX80/86/800/850	£2.75	£4.50
LX400	£3.50	£5.00
M1009/GLP	£2.95	£3.75
NEC P2200	£4.50	£5.00
Panasonic KX1080/81	£3.25	£4.75
Panasonic KX-P1124	£7.00	£5.00
Star LC24-10	£2.95	£6.00
Olivetti Ink Jet		
Cartridges (set of 4)	£6	

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595	£6
P115 for KX-P1107 & P145 for KX-P1124	£7
P140 for KX-P1540	£8
P155 for KX-P1624	£8
Colour Ribbons for KX-P1081, 1592 & 1595	
Brown, Blue or Red	£9 each

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments (i.e. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £24 (carr. £3)
132 Column version £29 (carr. £4)

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 printers to 1 Micro with our combined, Sharer/Changer switch boxes.

Standard Low Cost Type

Connects	Serial	Parallel
• 2 to 1	£10	£11
• 3 to 1	£13	£14
• 4 to 1	£16	£17

Professional Type

Connects	Serial	Parallel
• 2 to 1	£17	£18
• 3 to 1	£22	£25
• 5 to 1	£34	£38

Cables extra at £6 each

2 Way Compact Printer Switch

A handy 2 way printer switch can be attached to the micro or monitor for ease of use.

• Centronics £18; • Serial £17
(Cables extra at £6 each)

Auto Printer Sharer Switch

Connects	Serial	Parallel
2 to 1	£40	£45
4 to 1	£62	£49
8 to 1	—	£89

256k Multi Spooler

These Auto Parallel Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

• 2 In/2 out	£135	• 4 In/2 out	£169
• 8 In/1 out	£199		

Compact Converter Units

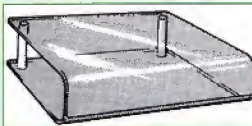
Serial to Parallel	£36	Parallel to Serial	£37
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Laser Direct



- Laser Direct Quire 6ppm complete £749
- Special High Res Card 600 DPI for Canon LPB 4 & LPB 8 Laser Printers £315
- LPB 4 Printer plus High Res Card £875
- LPB 8 III Printer plus High Res Card £1275

Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	£16 (carr £3)
136 Column version	£20 (carr £4)

Continued → → → → → → → →

QUEST MOUSE Mk III



- Quest Mouse III & Quest Paint £59
 - Quest Mouse III, Quest Paint, AMX Stop Press & Pagefont £89
 - Quest Mouse III only £30
 - Quest Paint Software only £34
 - Quest Font Disc (22 Text Fonts) £15
 - Quest Mouse Mat (Red or Blue or Green please specify) £3
 - Quest Colour Dump Disc – This new software allows you to print direct from Quest Paint to your Integrex Colour Printer £18
- (P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software

ConQuest

Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principle even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £32

Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version £25
QT-20 Archimedes Version £26

RB2 Marconi TRACKER BALL

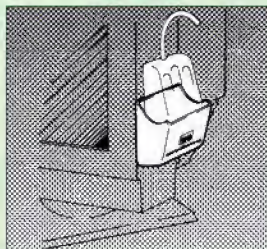
RB2 (AMX/Quest compatible) £36
RB2 including Quest Paint £69
RB2-A for Archimedes £37

THE NEW Mk III AMX MOUSE

• **AMX Mouse plus Super Art** £54
(Please specify for BBC, Master or Compact)

- AMX MOUSE ONLY £29
- AMX SUPERART Package £29
- AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse £25
- PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker £13
- AMX DESIGN (ROM) £34
- AMX XAM Educational £15
- AMX EXTRA EXTRA £16
- AMX MAX A gem of desktop (ROM) £20
- MOUSE MAT £3

WE Mouse House



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk.

It protects it from damage when not in use, yet within easy reach when you need it again. At £4 it does not cost a rodent's ransom.

Price £3

Mouse Cleaning Kit

To obtain trouble free operation and prolong the life of your mouse, it requires regular cleaning. Our deluxe mouse cleaning kit is ideal for the purpose £3



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £19

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro. This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket. The software supplied includes a sophisticated, fast screen dump routine. Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

£99

(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

Beeb Hand Scanner

Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer. The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware £115



Winner of the BBC Acorn User 1990
Award for the Best DTP/Word Processor

The Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GFX). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

Page Layout Section

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module incorporates the facilities like: pencil, brush, airbrush, polygon, circle, ellipse, fill, cut & paste, etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be - it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

Word-Processor

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

The Font Editor

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.

Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser.

Wapping Editor Software Pack £59
Wapping Editor plus Mouse £79

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc. Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages laid out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

Wapping Font Disc 1

Sixteen additional fonts, including smaller version of Oberon and Daisy and two new sizes of the standard font for the Wapping editor.

Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.

Supplied complete with instructions.

£12

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts for the Wapping Editor DTP pack. (80 track discs only).

£13

Archi A4 Scanner



This most advanced Archi A4 image scanner is supplied complete with ROM based podule software. Features provided include facilities for zooming in on an image and inverting the image in X and Y directions, saving and printing of the sprite created. Interactive help is supplied using the HELP application on the Acorn applications discs.

The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures.

Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400-dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.

Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.

All these features and facilities combine to make the Archi Page Scanner the fast and convenient way in which to add extra impact, interest and clarity to documents, reports, instruction sheets, manuals, news letters, etc., from your Archimedes DTP package.

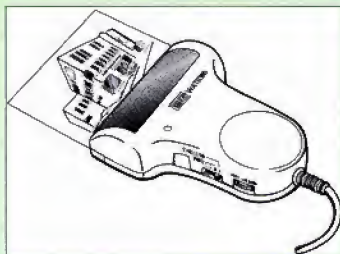
New Low Prices:

Archi A4 Scanner	£269
Sheet Feeder for above	£75
Scanner + Sheet Feeder	£359

Computer Concept Scanlight

• Scan-Light A4	£275
• Scan-Light A4 + Sheet Feeder	£368
• Scan-Light Junior mono	£130
• Scan-Light Junior 256	£197

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system, for only £149. The package includes the most comprehensive utility software available for the Archimedes, a high quality hand held scanner, and all necessary documentation to get you going straight away.

SCANNER

The scanner is capable of scanning up to an amazing 400 dots per inch (DPI). The scanning area is 4" wide, and the height is only limited by the maximum amount of memory available. The dot resolution may be switched to 100, 200, 300 or the maximum 400 dpi. One of four operating modes may be selected offering either pure monochrome scanning, or one of three grey level modes. The grey level modes use different size dither patterns to represent up to 16 shades of grey. There is also a dial to allow the "brightness" to be adjusted over a wide range, in order to optimise the quality for any specific image. The scanner interface is a standard, single width, expansion card (podule) which plugs into the Archimedes' backplane. The socket on the rear panel connects the scanner by 1.8 metres of cable.

SCANNER SOFTWARE

Full use is made of the windowing and the multi-tasking facilities of RiscOS. The software is supplied in a 64KByte ROM located on the interface board. The scanner appears as a small icon on the desktop icon bar, and the software is retrieved from the ROM simply by clicking on that icon. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. The other facilities included in the software are:

Cropping and scaling to any size including stretching and squashing in X and Y direction separately.

Colour tinting.

X and Y flip.

Edge detection which turns solid objects into outlines.

Selective directional copying which allows features (i.e. lines or text) to be made thicker or thinner.

Scanned images may be saved as sprite files or transferred directly into other RiscOS applications (DTP, Draw, Paint) simply by dragging the sprite file into the application's window. Sprites may also be generated using anti-aliasing. This greatly improves picture quality and is particularly effective when scanning material with a range of grey tones, such as photographs. Images can be printed on any printer that is supported by a RiscOS printer driver, with optional settings for portrait or landscape modes, image scale and positioning. Images are printed using the full resolution of the printer and are not limited to the screen resolution.

On-screen help is provided via the RiscOS interactive help facility. Calls are also provided in the ROM for users wishing to write their own software, incorporating the use of the scanner.

AHS-4 Archi 300/400 Version £119

AHS-3 Archi A3000 Version £129

Continued → → → → → → → →

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B and B+ compatible.

ONLY £18

BBC B Low Profile Cartridge System

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

- Complete System **£11**
- Spare Cartridges **£2.75**
- Spare Rack **£1.65**

ROM Cartridges for the BBC Master

Will also accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin £8; Quad £13

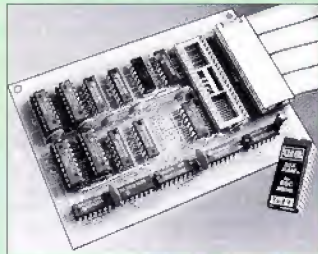
User Port Splitter Unit



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at £22

32K Shadow RAM/Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

Simply plug the ribbon cable plug into the 6502 socket and gain a massive 32K of extra RAM.

- While word processing, you don't wait for a slow printer, type in text while printing and save on expensive printer buffers.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28K bytes free - 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the full 32k or the bottom 12K of the expansion RAM as a printer buffer. (P.S. Only 12K printer buffer can be used with Wordwise & WW+, due to the way they are written).
- Unique facility to turn ROMs off and on again.

Only £54

(Price includes a comprehensive manual and the ROM)



Commander Joystick



Watford Electronics' new Commander Joystick for the BBC B and Master 128K has a unique dual mode of operation giving selective free floating or self centring fully variable control in both X and Y axis directions. Commander is particularly good for flight simulation and drawing programs.

Features:

- Direct connection to BBC Analogue input port - no interface needed.
- Fully compatible with all BBC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
- Trim adjusters for both X and Y axes for fine centre adjustment.
- Convenient stick mounted fire button with additional base buttons.

Price: £15



ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobol, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro - no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£59**

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost:

Price:	Aries B-12	£36
	Aries B-12C	£5

Aries B-488 IEEE-488 Interface Unit

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238

Voltmace Joysticks

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£15
Delta 3C Joystick for Compact	£10
Delta 14B Single Joystick	£11
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7
Delta-Cat A mouse eliminator Joystick for the Archimedes	£24

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128

£25

Computer Concept's ROMS

Communicator	£49
Disc Doctor	£18
Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
Mega-3 ROM	£76
Spell Master	£42
Wordwise	£24

Wordwise plus

£40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every **WORDWISE PLUS** package bought from us.

Word-Aid

The most comprehensive utilities ROM

for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only £24

(N.B. Word Aid requires a Disc interface in your Micro)

Acorn ROMS

View 3.0 ROM	£45
Viewsheet (Acornsoft)	£36
Viewstore	£36
Viewspell with 80 track disc	£25
Viewplot Disc	£20
(Please specify for Master 128 or Compact)	
View-Index	£12
Overview packs 1 & 2	£65
Hi-View	£38

MINI OFFICE II

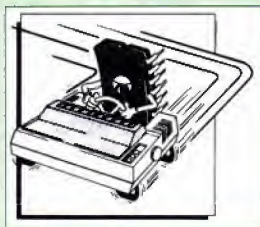
DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.00
DISC Version for the Compact	£18.00

(When ordering please specify for which Micro & 40 or 80 track Disc)

View Printer Driver Discs

Epson FX & RX 80	£10
Juki & Brother HR	£10

View Printer Driver ROM



View is a powerful word processor, but it seriously lacks in terms of printer driver support. With the View Printer Driver ROM, the View users will find themselves in the realms of advanced word processing.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, Hi80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

Price: Only £29

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OFFICE MASTER



CASHBOOK - A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS - Will take data prepared by the Cashbook module and produce a complete set of accounts as follows: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST - A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER - A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS - Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL - Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only £21 (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBLOT GRAPHICS

DATABASE - Set up a computerised card index system with powerful search facilities.

SPREADSHEET - Offers many calculation and editing features

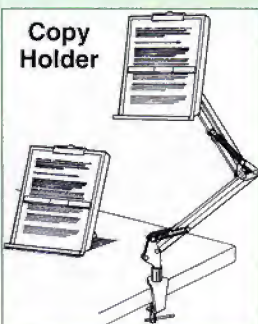
BEEBLOT - Provides visual representation from Spreadsheet data.

Only £10 (Disc)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £14

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip.

Desk Top £8
Angle poise £12

NEW Copy holders as above but with a battery operated, remote controlled cursor/ruler. (By hand or foot pedal.) (Batteries 2 x AA not included.) These units are extremely handy.

The Epson RX/FX/KAGA Printer Commands Revealed Handbook

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities - he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out? Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£6.95
15 Hr Wordprocessing BBC/NW & WW	£6.95
30 Hour BASIC (BBC Micro)	£12.95
1st Word Plus Rel. 2 Manual	£10.00
A3000 Technical Reference Manual	£29.00
Acorn DTP A Guide to	£17.00
Advanced User Guide for BBC	£10.95
Archimedes 1st Step - Beginners Guide	£9.95
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Archimedes BBC Basic Guide	£20
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Archimedes Risc-Os Programmers Reference Manual	£79.00
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BBC Basic Guide (Archimedes)	£19.95
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View Guide (View 2.1)	£5.00
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VIEW Dabhand Guide	£12.95
Viewsheet User Guide	£10
Viewstore User Guide	£10
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Z88 Computing	£9.95
Z88 Magic	£14.95

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1-2-3 Using - Rel. 3	£25.95
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8086/8088 Programming the	£17.95
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Agenda - Using	£21.95
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Aldus Pagemaker - Using	£21.45
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Assembly Language Quick Ref	£8.45
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Autocad - Mastering Through Rel. 10	£28.95
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Autocad - Inside 6th Ed	£36.95
Autocad - Mastering Through Rel II	£28.95
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C - Teach Yourself	£19.95
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Corel Draw 2nd Ed Mastering	£26.50

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Carriage on Books vary between £2 to £4.00, depending on their weight

New Release ACORN TO PC

Stop the Confusion!

Do you have to use both Acorn computers and PC's? Would you like to use your Archimedes or A3000 in PC-emulation mode but are unsure of the new commands?

Although Acorn machines (such as the BBC B, the Master, the Archimedes and the BBC A3000) are mainly used in education, most commercial computers use other operating systems, particularly MS-DOS. As a result school computer users are at a disadvantage when moving into 'business' computing. PCs and other commercial computers use MS-DOS as the operating system, so commands for formatting, copying, backing up, printing and the modern are not the same. Even file names are written differently! And did you know that there is one Acorn command which, if used in MS-DOS, wipes everything in the current directory?

'ACORN TO PC' enables you to change over painlessly. It shows clearly and quickly how, why and where the two systems (Acorn and MS-DOS) differ. As with a foreign language dictionary, you can use the book to transfer either way - from Acorn to MS-DOS, or from MS-DOS to Acorn. 'ACORN TO PC' also acts as a handy reference guide to all Acorn star commands and their MS-DOS equivalents. It also has an extensive and readable explanation of the directory tree and hierarchical filing systems in general. Both DFS and ADFS Acorn systems are covered. 'ACORN TO PC' is written clearly and concisely by Dr. John Lockley, who has wide experience of writing and broadcasting. He is currently appearing as a regular contributor on Radio 5, and is co-author of 'The Complete BBC Computer User Handbook'.

Price: £12.95 (No VAT)

The Complete BBC Computer User Handbook

If you own a BBC B, B+, Electron, Master 128 or Master Compact, or Archimedes, then this is the book for you. It shows how to get the best from your machine, and how to make it work for you. The general style and level of presentation means that both the expert and beginner alike will feel comfortable with the quality and quantity of the material. Subjects covered include the general use of computers, hardware design and peripheral devices like printers, disc drives, etc. and Networking. Programming hints and tips and various disciplines for making a better program are discussed in some detail, including debugging of specific errors. Standard programs are covered, such as wordprocessors, spreadsheets, databases, graphics, communications, etc., which brings you neatly on to the subject of using computers in the office or at work - even giving advice on writing and marketing your own programs.

A book you will enjoy to use as a reference, or read from cover to cover, over and over.

Only: £14.95 (No VAT)

The Complete Mouse User Guide to BBC Micro

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

Example programs on Disc £4.95

Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed. Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats: INTEGER, REAL & STRING.

Price: £38

Beeb DOS 3.0

(Now reads Archimedes Discs)

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

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By an innovative use of on-board memory, the card will remember its configuration, even if moved to another slot or even a different machine, this also includes the unique security features.

Hardware

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- Built in Non Volatile RAM to hold configuration
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- Up to two drives (master and slave) per card
- Multiple cards per machine (up to four)

Software

- Conforms fully to the Acorn IDE Specification
- All software supplied in ROM
- Filing system 'IDEFS'
- Desktop filer with drive ready detection and disc name under icon
- IDEForm, WIMP based configuration and formatting software
- Drives can be individually write protected
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- IDEFSDisk, creates PC emulator hard discs

Prices

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For A3000 users an additional external Case and PSU will be required.

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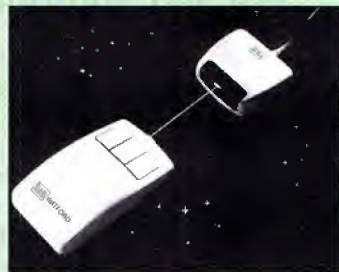
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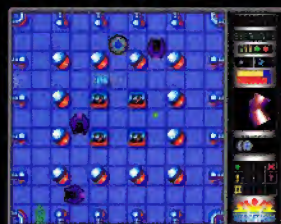
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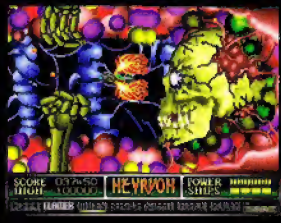
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In the first of a two-part series on special needs, **CHRIS DRAGE** looks at some hardware options



WITHIN REACH

The hardware options for special needs computing have been growing steadily in recent years. This is especially true for the RiscOS machines which, until recently, were overshadowed by the Beeb.

Acorn has now put together a BBC A3000 Special Access System (see above) in two guises: the first includes the computer, a serial upgrade, Morley Electronics' User/Analogue card and seven utility programs; the second also includes a monitor and Pres monitor stand.

The upgrades allow access to overlay keyboards, touch screens, modems and switches, but it is the utilities provided which are at the heart of the package. One of the utilities provided is *ASP*, switch interface software which allows disabled users to access Risc OS applications, by using a single switch device.

The others included are: *SpecialKB* which allows the numeric keypad to emulate mouse functions with a very useful 'sticky keys' option to emulate multiple key presses. *BigPtr* offers an enlarged and visible pointer whereas *Closeup* presents a small magnified window which can move around the screen. *Flasher* gives a more visible flashing caret and a cursor-homing device. With *Chars*, typing can be achieved, using the mouse to select characters from a screen display. *Bigscren* (Mode 36 & 37) and *ScreenV* (Mode 43) are both large screen modes to display text, icons and menus in larger sizes. The Acorn package also allows you to use Midi (musical instrument digital interface) equipment.

There are many other interfaces and upgrades

that can be used to connect up external devices (the Morley Electronics User/Analogue module is good value for money) but Access 1000 from Hybrid Technology enables overlay keyboards, touch windows, joysticks, switch units and the company's *Arc Recorder* to be connected to a BBC A3000/Archimedes computer without using the standard module user port.

Indeed, the Access 1000 combines the functions of the user port and a switch access box forming the basis of Hybrid's Access Link, which permits add-ons to be daisy-chained on to the computer's printer port. These avoids the need for the serial port upgrade so leaving it free for other add-ons. The interface has four jack sockets designed to take switches and a familiar BBC-style user port connector and also provides a small through-connector with the printer connected at the end of the queue.

To input information into the computer without relying on the keyboard, the Concept



Touch screens encourage improved dexterity



Northwest SEMERC's Overlay Keyboard

Keyboard is the mainstay, with over 120 overlay keyboard programs. The overlay keyboard is extremely versatile, since it is simply a piece of paper. Basically, it provides a choice of icons which the user presses instead of the normal keys. They consist of 128 programmable cells, but you don't need to know that since you usually only load a program and use it. *Concept Designer* and *Conform* make programming the device easy, if you want to create overlays for a specific purpose. *Touch Explorer Plus*, *Folio*, *Concept Kids* are also impressive programs.

The Overlay Keyboard is made from high-impact plastic, which makes it both light and sturdy, meeting educational safety and design criteria extremely well. It works with the BBC B/Master and the BBC A3000/Archimedes if a user port or Access 1000 is present. A single switch interface is built in as standard and is used by inserting the switch jack plug into a socket which automatically disables the keyboard and selects the switch. Most importantly, the Overlay Keyboard is completely compatible with all existing software.

Other input devices include touch screens (see *BAU* February 92 issue), alternative keyboards, mice, trackballs, switches and voice input devices. Two leading TouchWindow systems (Keyboard Technology and Linguinity) are made up of the same hardware, with differing software drivers. They are accurate, responsive and can be adapted to fit almost any monitor. Their high resolution, coupled with the ability to be removed from the monitor to be used as a 'tracing window', add to their versatility.

One successful alternative to the mouse is the Delta Cat which can prove very useful in specific circumstances, especially if the joystick is firmly mounted and an extension tube is fitted over the stumpy control stick. It can offer control via foot (buttons) and mouth (stick). If you require a better mouse than the standard one provided with the Archimedes, then I recommend Clares' rodent, which nestles comfortably in the palm of the hand, allowing the fingers to rest more naturally over the buttons.

For a trackball (literally an upside-down mouse) the sturdy Marconi unit has performed well over the years, but is shortly to be eclipsed by the new Ark Tracker. Not only is this tracker ball extremely rugged but it has all the mouse operations on separate buttons. A perspex overlay can be added to help with locating the

buttons and a separate switch provides control over the pointer speed. As the unit remains stationary, pointer operation is controlled, with the fingers alone negating the need to move the whole arm - useful for a disabled person who has fine motor control but finds larger arm movement more difficult.

For those whose only means of communication with a Beeb is their voice, the MicroMike has proven successful, giving voice-volume control over a variety of activities. It can promote vocal play, control of volume and timing of vocalisation. In order to use the device with an A3000/Archimedes, a user port must be installed. The popular *Sid* and *Mike* software has now been converted to Archimedes use.

Alternatives to the standard keyboard are available from Special Access Systems, starting with a metal keyboard which fastens on to the keyboard. Holes on the keyboard permit hands to rest on the guard, while fingers can access individual key holes. The company's Programmable Expanded Keyboard should also prove valuable to those who are restricted to using a toe, mouthstick, headpointer or a single finger. Users can also perform multikey presses as one operation and four programmable delays can cope with uncertain or over-long key presses. Furthermore, bright LEDs or programmable sounds can help those with sensory disabilities to know when a key has been pressed.

Contact Keyboards (Keyboard Technology) clip on over the existing keyboard, keeping unused keys hidden from prying fingers and making programs highly resistant to accidental crashes. Obviously such a device is tied to specific software applications and as yet, only two models are available: the Matchbox Keyboard (for matching games) and Moneybox Keyboard to accompany the Moneybox suite of software. One advantage of these devices is that they provide sensory feedback to the user.

Incidentally, the Matchmaker interface can be used to connect virtually any input device (switch, joystick, trackball, overlay keyboard, and so on.) Next month, we will look at the software options for special needs.

THE LAST WORD

It always makes sense to see hardware in action before you rush out and buy it. The good news is that all of the hardware mentioned here will be on show at the Northwest SEMERC's Micros for Special Needs Exhibition in Oldham in October. Northwest SEMERC, under director Martin



Little (right) is a fountain of information, help and advice. If you are involved in special education, then the exhibition is worth a visit. Northwest SEMERC also publishes a special needs newsletter entitled *Copy* which is full of interesting case studies and reviews of how people are coping with the BBC, A3000, Archimedes and other machines. Contact Northwest SEMERC on 061-627 4469.

PRODUCT DETAILS

Product: BBC A3000 Special Access System
Suppliers: Acorn Computers
Tel: (0223) 245200
Prices: £679 without monitor, £899 complete. Educational establishments and home users registered as disabled pay £579 without monitor, £765 complete

Product: Overlay Keyboard
Suppliers: Northwest SEMERC
Tel: 061-627 4469
Price: £120 (education discounts)

Product: Access 1000
Suppliers: Hybrid Technology
Tel: (0223) 861522
Price: £49 (£58 with Access Link power supply)

Product: Touchwindow and Contact Keyboards
Suppliers: Keyboard Technology
Tel: (0509) 610706
Price: Touchwindow - £244. BBC driver £25. The Contact Keyboard - £29.95 - £37.50 (BBC B), £47.50 (BBC A3000/Archimedes)

Product: Touchwindow
Supplier: Linds International
Tel: (0986) 85477
Price: £248

Product: Alternative mouse
Supplier: Clares Micro Supplies
Tel: (0968) 85477
Price: £27.24

Product: Delta Cat
Supplier: Voltmace
Tel: (0462) 894410
Price: £29.74

Product: Marconi Trackerball
Supplier: Technomatic
Tel: 081-205 9558
Price: £30

Product: Micromike
Supplier: Daco Software
Tel: 021-7068933
Price: Standard Micromike, £43.50
Desktop Micromike, £52.50

Product: Keyguards and Programmable Expanded Keyboard
Supplier: Special Access Systems
Tel: (0203) 711861
Price: £470

Product: Matchmaker
Supplier: SRS Systems
Tel: 021-643-2877
Price: £850

All prices exclude VAT

THREE REASONS TO CELEBRATE

IMPRESSION II



Impression II was awarded the Computer Shopper award for the best non-PC business software.

Given the prestigious nature of the other nominees, this award is particularly satisfying.

Amongst the other nominees were Adobe Illustrator for the Mac, Claris Works for the Mac and WordPerfect also for the Mac.



As of the end 1991 sales of Impression topped 15,000 copies, making this the most successful Archimedes product to date.



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CHANGING FACES

JAN VIBE presents a new look at animation on Acorn machines

Is there anybody who has not seen Michael Jackson's video, *Dangerous*? In the video there is an fascinating sequence of faces which change softly from one to another. This made me wonder if it was possible to do something similar on my trusty Acorn machine. Well, it was, and here it is...

The program draws a face on the screen. Then slowly the face undergoes a metamorphosis, changing into another and another. It is a great showpiece, and has an almost hypnotic effect on people. Part of the inspiration came from an excellent book by A Dewdney called *The Armchair Universe*. In fact, the data for the face is based on an example within the book.

THE THEORY

The program initialises by setting up two screens, an active and a shadow screen. It then generates two completely different faces, let's call them face1 and face2. These faces are stored as PLOT commands in arrays.

In the main loop, the co-ordinates for face1 and face2 are being averaged by a formula which, at the start of the loop is weighted solely towards face1 but, at the end of the loop is weighted solely towards face2. By using this formula, a face which lies somewhere in between can be generated.

This face is drawn on the shadow screen. When the drawing is finished, the active and shadow screens are switched, the weight is changed a little towards face2 and the main loop is entered again. The face is eventually changed totally into face2, then face2 is made into face1, a new face2 is generated and the changing process starts again.

THE PRACTICE

To run the program, type in *Face1* and *Face2*, (see our yellow pages box). When you run *Face1* some data will be created, then you can run *Face2*, the main animation routine.

The program consists of three parts: an initialisation, a face generator and a main loop, which makes the face slowly change from one to another. The most complex part of the program is the procedure *PROCdistort*. It takes the array distort and returns it distorted by the required amount. Two arrays, *refx* and *refy*, are the coordinates for face1 and face2. The original coordinates are not changed at all by the distortion of the face and are these are therefore stored in a single array.

The distortion method is mainly a simple multiplication around a point. It works like this: $X_dist = (X_face - X_ref) * Z_dist + X_ref$ where X_dist is the distorted x value, X_face is the original value of x, X_ref is the reference point and Z_dist is the distortion factor. The same calculation is of



course being done for Y_dist . In the procedure, the distortion factors (facewidth etc...) are generated by the random number function *FNrd(min,max)*. Then the nine reference points are read into the arrays *refx* and *refy*.

These points are used in combination with the distortion factors when changing certain parts of the face. The first of the reference points is a global point, used for distorting the entire face. Reference points two to nine also go through the distortion calculation. Incidentally, line 1230 in this loop contains the calculation that makes the face egg shaped, with the point either at the top or the bottom.

In the main loop (1290-1650) the points of the face are distorted. The general distortion of the entire face is being handled by lines 1300 to 1320. This calculation is exactly the same as the one shown in lines 1220 to 1260. Most of the distortion of various parts of the face are made by multiplication around a point, but some require that the parts are moved too — such as in the case of the eyebrows. This happens at lines 1370 and 1410 (the distance between the eyes) and also at line 1590 (which produces the raising of the eyebrows).

The part of the face to be distorted by certain factors is controlled by counting the points in the face-drawing and by testing the counter. This is what happens in the various *WHEN* blocks. When the counter has reached 186, the face drawing is complete. The distorted face is then stored in arrays, which takes place at lines 1630 and 1640.

EIGHT-BIT BONUS

BAU programming guru, David Lawrence has also written a version of *Face* for eight-bit owners. To use it, type in *Face3*, *Face4* and *Face5* (see our yellow pages box) and then run them in sequence. If *PAGE* is greater than &1100, you need to lower it to this value before running. The program works by calculating the in-between stages (this will take 20 or so seconds) and then the animation takes place.

MODIFICATIONS

There are lots of ways that this program could be extended. Colour is the obvious one, although it might make the program too slow. Or how about user control to make an interactive identikit. Indeed, why stop at the face? The program could be used on the entire human body!

YELLOW PAGES

The program shown here can be obtained in one of two ways. Either turn to our yellow pages section and type the program in, or if you are a subscriber, simply load it from your free monthly disc.

THE BBC MICRO

A forthcoming BBC programme will chart the progress of home computing

Computer technology has taken a quantum leap in the past 10 years or so and now personal computers can now be found in many homes and offices. Yet in the late 70s this was the faraway dream of a few electronics boffins, who were putting together boards and switches on kitchen tables and calling them 'computers'. Personal computing started to gain momentum just over a decade ago, courtesy of the BBC's computer literacy project which set out to explain the principles of computing to a wider audience.

The literacy project was based around various television programmes, the first in 1982 also marked the television debut of the BBC micro computer. *And the rest, as they say, is history...*

It is that history which the BBC is celebrating in a special 30-minute programme, *The Trojan Mouse*, due to be screened on Sunday April 5 (see box for details). This programme will examine the effects of the computer literacy project and the BBC micro on personal computing, as well as highlight the key developments



Humble beginnings with the Acorn Atom

of the past decade. To coincide with the programme, we have put together a special supplement which you can find in next month's *BBC Acorn User*. The magazine was actually launched in response to the success of both the TV computer literacy programmes and the Acorn-produced BBC micro – and we have been around ever since, charting the ups and downs of the Acorn market.

This month, as a 'taster' to the programme, we look back through our archives at some of the key milestones, from the Acorn Atom right up to the launch of the latest Archimedes A5000. For the full story, be sure not to miss our special supplement next month.

ATOMIC

Founded in 1979 by Hermann Hauser and Chris Curry, Acorn Computers launched the System One, followed by the Acorn Atom. Roger Wilson joined the company straight from university to help design the Atom and remains with the company today, developing new projects.

TROJAN MOUSE

The Trojan Mouse is a 30-minute programme charting the introduction of the BBC computer literacy project, the various series on home computing which it launched and the introduction of the first BBC micro computer. Produced by Dave Thomas, who was responsible for producing previous computer programmes, the programme is hosted by Ian MacNaught Davis, who appeared in the first series.

The programme traces the evolution of the project, the related hardware and software achievements, and talks to many of the people who were involved along the way – from Cambridge graduates putting together the earliest prototypes, to teachers whose lives were completely changed by the introduction of the first BBC micros.

Innovators from Acorn, including Hermann Hauser (co-founder of Acorn) and Roger Wilson and Steve Furber (who helped design the first BBC micro and later developed the Arm chip) are interviewed. But the programme isn't just about the past – it brings you up to date with current developments and poses some questions about the future.

So be sure to tune in to Trojan Mouse on BBC1, Sunday April 5, 10.30am. (The programme will be repeated on Monday April 13).

THE BRIEF

To support the computer literacy project, the BBC was looking for a partner to produce and market a home computer, which would be featured in the first series. Richard Russell at the BBC produced a detailed specification for the



required machine. Hermann Hauser and Chris Curry put forward the Acorn Proton design, which was to more than match the specification. In April 1981, Acorn was contracted to supply 12,000 machines that the BBC expected to sell by mail order...

ONE YEAR ON

'Where do we go from here?' asked John Radcliffe, executive producer of the computer literacy project, one year after it was launched. The figure of 12,000 machines was cautious – in fact, more than that were ordered before the first series was even screened.

The result? A runaway success for the BBC and Acorn with further series in the pipeline. Also the Micros in Schools scheme was launched – the brainchild of Kenneth Baker, the education secretary at that time. The scheme was to subsidise the purchase of BBC micros and other approved machines.

THE ELECTRON

Chris Curry wanted to lead Acorn further into the fast-expanding mass market for cheap computers and Acorn launched the Electron in 1983, timed for the Christmas rush and priced at £199. While popular, it was to be dogged by production problems and by Christmas 1984 public enthusiasm had waned and one-third of the Electrons built were apparently never sold.



: TEN YEARS ON

since the BBC micro made its TV debut 10 years ago. **BARRY MONK** reports

JUST THE BUSINESS

The Acorn Business Computer was launched in 1984, but it was large and unwieldy and never recouped the huge resources expended on its development.



The BBC Master-driven Domesday machine

Following a disastrous Christmas 1984 sales period, newspaper articles, particularly in *The Sunday Times*, suggested all was not well with the company.

The share price fell and finally the Italian computer giant, Olivetti, stepped in to save the company. Curry and Hauser signed away their controlling interests to Olivetti, but both stayed on as board directors.

MASTER STROKE

Launched in 1986, the Master series seemed to some observers as an anomaly. It was refinement of the original BBC micro at a time when there was a mass migration, by other cheap computers, to the 16-bit, MS-Dos standard of the successful IBM PC.

While cheaper to manufacture, the Master was more expensive to buy and, outside the Acorn education stronghold, it did not achieve the same level of sales as the original BBC micro. The Master Compact followed, but offered little that was new, except that it was packaged in three boxes rather than the customary two.

THE DOMESDAY PROJECT

The BBC Domesday Project was launched in 1986. It was meant to be a modern equivalent of *The Domesday Book*, using modern technology (notably a laser video disc system) to store and retrieve a massive amount of information about general life in Britain.

SPECIAL SUPPLEMENT NEXT MONTH

To coincide with the programme, BBC Acorn User is producing a special supplement which will appear in next month's issue. It will be packed with interesting facts and figures, charting the ups and downs of the Acorn market and looking at some of the key people who have helped to shape home computing.

Producers involved with the early series will give their assessment of what has taken place over the past decade and we will trace the history of Acorn in detail, with a machine 'family tree' and profile the key people involved.

There will also be an overview of the impact of computing on education, how the BBC micro changed some people's lives, and we'll be doing some crystal ball gazing into the future.

So, whether you are an avid BBC micro fan, or you are just interested in finding out why this machine has had such an impact on personal computing, be sure not to miss our special supplement.

Place an order with your newsagent now - you can use the special coupon on page 85 of this issue. Or to subscribe to the magazine turn to page 29 for details of our special subscription offer.



TAKING RISKS

The advanced research and development team, under Roger Wilson and Steve Furber, developed the Arm chip and its companions that eventually became the Archimedes 300 and 400 series computers. Based on Risc technology, the original machines carried the BBC tag, but this was to cause much controversy as the Corporation was seen to be endorsing untried technology. The original (stop-gap) Arthur operating system was later to become Risc OS.

HAIL THE A3000

The new BBC micro, which was viewed as the logical 32-bit successor to the Master series, was the A3000. More affordable than the Archi-



medes, the neat single-box design encased a machine which was 10 percent faster than the Arc, and represented a more keenly priced BBC micro which would appeal to both education and home users. The Learning Curve package, including an A3000 and supporting software, was the next marketing step to encourage more home computer sales.

UP TO DATE

Acorn has updated the Archimedes with the 440/1 and top-of-the-range A540, as well as the R140 Unix machine. The Archimedes A5000 is the latest Acorn machine.

Revealed at the BBC Acorn User show last October, it is a three-box solution (machine, keyboard and multiscan monitor) featuring the fast Arm3 chip and new operating system, Risc OS 3. PC-like in appearance, it retains Acorn's philosophy of advanced technology within a marketable package. But what of the future? Find out in next month's special issue of *BAU*.

REMOVABLE, PORTABLE, EXPANDABLE AND SECURE



Sounds too good to be true. Morley Electronics new removable cartridge hard disc systems can work on the A3000 through to the A540 (including the new A5000) as well as on BBC Master computers.

The secret lies in the hard disc cartridge which after dismounting can be taken out and stored, or be replaced by another cartridge within a few seconds. Security is so easy with these discs because you can simply take them home or lock them away.

The unit can also be used as a backup system for internal hard drives as well. Once you have looked at the prices you will see that they are significantly cheaper than tape streamer systems. You also have virtually instant access to the information stored on them because

they are a hard disc and therefore it is simply a matter of copying files from one disc to another instead of having to run lengthy restore programs to recover information from tape.

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If you've been following this series, you will know I promised to start this month with some more information about negative numbers. I've already introduced the concept of the *twos complement* method of representing negative numbers, and all that remains is to tell you how you can directly load registers with negative numbers. Unfortunately you cannot use the obvious: `MOV R0,#-4`.

The instruction that we use is `MVN` or `MoVe Not`, but, to be even more awkward, you cannot simply say: `MVN R0,#-4` or even: `MVN R0,#4`.

For some reason best known to Acorn, you have to supply the *ones complement* of the number. Remember with twos complement you change all the 0s to 1s and 1s to 0s and then add 1. Well, with ones complement, you simply don't add the 1. The easiest way to do it with the Basic assembler is to use the Basic keyword `NOT`. This is more commonly used to provide the 'opposite' case in an `IF` statement, such as `IF NOT flag% THEN...` In fact, `NOT` actually performs the ones complement of its parameter - very handy! You can therefore load a negative number simply with `MVN R0,NOT -4`.

Some other assemblers, such as Acorn's own macro-assembler *Aasm*, actually allow `MOV` with negative numbers, and simply perform the necessary bit-shuffling on the constant and assemble a `MVN` instruction instead. Although you might have typed `MOV R0,#-1`, if you have a look at the actual machine code the assembler has created, it will say `MVN R0,#0`.

It is not possible to supply negative numbers as parameters to other instructions. It's a silly example, but you cannot say, `ADD R0,R1,#-56` as some assemblers may translate instructions such as these into more appropriate ones. You might like to try typing in listing one in the yellow pages, which demonstrates the use of simple arithmetic on negative numbers. Try following through the stages by 'hand' first to make sure you understand everything as it happens.

HEXADECIMAL

Before moving on, I'd like to outline the basics of the hexadecimal number system. Clearly, referring to numbers in binary is quite contrived, not to say time consuming: 'Pardon? Was that 1001101001 or 1001011001?'

Because binary is all based on powers of two, and 10 isn't a power of two, you cannot directly use decimal, which is a shame, since most of you will be used to that already! Some computer systems use base eight, or *octal*, which uses the decimal digits 0 to 7. Converting from binary to octal is relatively easy - you simply take your binary number and chop it into three-bit chunks, which are then converted to octal (effectively decimal in this case).

For example, 923 in decimal is:

```
1110011011
001110011011
1 6 3 3
```

The number 923 in octal is therefore 1633. Note this should be read 1,6,3,3 octal, to avoid confusion with one thousand six hundred and thirty three. The disadvantage of octal is the chunks of three - not a nice power of two! Quadral could be used (with two-bit chunks) but then you're almost back to binary.

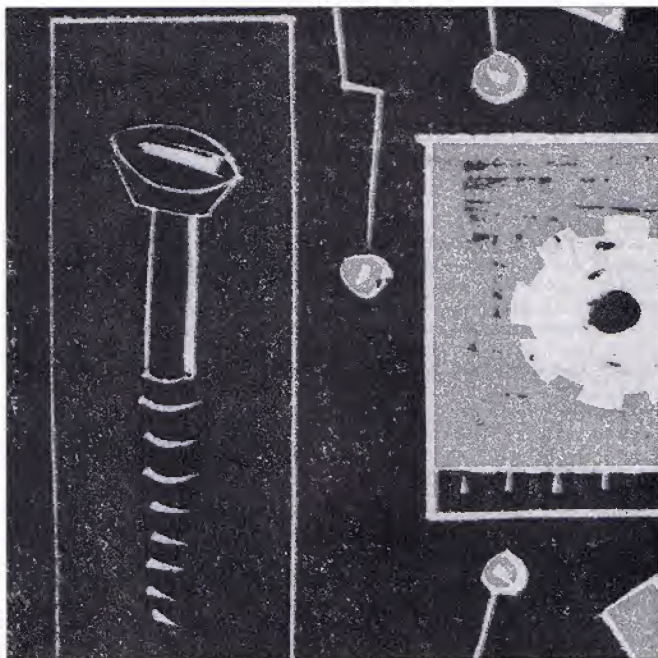


ILLUSTRATION BY PAUL SCHOFIELD

ASSEMBLY LINE

DAVE LAWRENCE

continues his series

on Arm

programming

with a look at

negative numbers

So, hexadecimal is the most common notation. This is base 16 and uses four-bit chunks of data, and is often abbreviated to 'hex'.

Of course, decimal only has 10 digits, so the letters A to F are used to represent the decimal numbers 10 to 15. Conversion to hex proceeds as for octal, except in four-bit chunks:

```
1110011011 (923)
001110011011
3 9 B
```

Hex numbers are often written with a preceding '&' to avoid confusion with decimal numbers - so 923=&39B. As mentioned before, one binary digit is called a bit. Historically, eight bits are called a *byte*. This is derived from early computers which were eight-bit machines (like the

6502), with *byte* being a corruption of *bite*, being a shortened form of BIT Eight.

So 32 bits are often called a *word*, although some computer systems, such as the 68000, call this a *long word* and use *word* to mean 16 bits. Words are 32 bits long in the Arm. Going the other way, half a byte (four bits, one hex digit) is, of course, a *nibble*. And no, I'm not joking!

LARGER NUMBERS

Next on the list of things to explain is larger numbers. Until now, I've told you to keep the numbers that you load into registers under 256, but not to worry about the size of intermediate results. Last month I mentioned that the Arm is a 32-bit processor and can therefore deal with 32 bits at a time. So, why can you not say `MOV R0, #987`? After all, 987 in binary is only a 10-bit binary number.

The problem lies in the way Arm instructions are stored in memory and also explains why you have to use the ones complement notation for specifying numbers. In the first article in this series, I explained that it is the job of the assembler to translate the 'human' words `MOV`, `ADD`, `MUL` and so on, into the appropriate sequences of bits that the Arm understands.

One of the good features of the Arm is that all its instructions are encoded to the same length, namely 32 bits (one word). It is a coincidence that the processor is a 32-bit processor. Many other processors (such as the 6502, 68000 or 80x86) have variable length instructions. In 6502, `PHA` is only eight bits 'long', whereas `LDA &3D00,X` is 24 bits. In such cases it is common for the first byte (or whatever) to be the base instruction and, if necessary, subsequent bytes to form parameters for the operation.

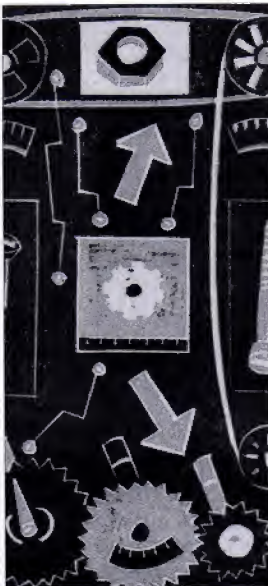
Anyway, back to the Arm. When it processes an instruction, it grabs a whole 'word' instruction and examines certain bits (in both senses of the word) to see what sort of instruction it is dealing with. For example, if bits 26 and 27 are clear (0), then the instruction is a simple data processing instruction such as `MOV`, `ADD` or `RSB`.

With this in mind, the Arm can then make sense of the rest of the bits. Certain bits have a fixed meaning: bits 28 to 31 are the condition code (more about these later in the series) but others will vary according to the initial 'class' of instruction. The important upshot of all this is that all parameters for instructions have to fit within these 32 bits, hence you cannot supply a full 32-bit number to `MOV` and so on.

In fact, as you are allowed to supply a constant on the end of an addition: `ADD R0,R4,#64`. As well as the '64', those 32 bits have to store the fact that: you have specified `ADD`; you are using `R0` and `R4` and condition code mentioned earlier, as well as a couple of other twiddles which I will come to later.

From the grand total of 32, this leaves only 12 bits to specify the constant. Rather than doing the obvious, and making these 12 bits bits 0 to 11 of a 12-bit constant (which would only allow the numbers 0 to 4095), Acorn splits the 12 bits into two fields, one eight-bit constant and one four-bit 'shift'.

The shift is how many bits the eight-bit constant is offset. This is the computer's way of thinking about it – mathematically, the value



YELLOW PAGES

To find the programs mentioned in this article, please turn to the yellow pages, under the section entitled *Arm Assembler*. They can also be found on the subscribers' monthly disc.

represented is: $value \times 2^{(2 \times shift)}$. So, with a shift of zero, you can represent the numbers 0 to 255; with a shift of one, the numbers, 0, 4, 8, 12, ... 1020; with a shift of two, the numbers 0, 16, 32, ... 4080 and so on.

Unfortunately, I have to admit that this is a bit of fib – the shift value doesn't really work in this way. It is actually an offset in the opposite direction, so my shift of one above is actually stored internally as 15, two is represented by 14, and so on. A 'real' shift of one moves the value right and off the bottom of the 32 bits available.

But it doesn't just fall into hyperspace – bits 0 and 1 'wrap round' and become bits 30 and 31. A shift of four moves the value eight bits to the right, thus all the bits wrap round, allowing you to access the 'top byte' of the 32-bit word. Luckily you never need to worry about the way constants are stored within the instructions, since the assembler does all the work of converting your number into the necessary eight-bit value and four-bit shift.

If a constant you give cannot be converted, you will get an error such as 'Bad immediate constant'. Therefore all values 0 to 255 are fine (they are all eight-bit numbers anyway). 256 is fine because only bit eight is set (to 1) so it can be converted, however 257 cannot. Both bits 8 and 0 are set, so the 'value' cannot be represented by an eight-bit number.

The more astute of you may have noticed that because only four bits are available for the shift, only 16 'positions' are available for the value field. Because of this, numbers such as 258 cannot be represented.

Although the 'width' of the number is only eight, (so bit 8 and bit 1 are set) only one position of shift is needed, which cannot be represented with one of 16 positions available. However, 516 is allowable since an actual shift of two (shift field=15, remember) can be used with a value field of 129.

Although this system of value and shift offers a more limited range of 'small' numbers, it has the major advantage of allowing a reasonable range of 'large' numbers to be represented as well. Powers of two are often used within programs for a number of reasons and, as these have only one bit set, all 32 of them can be represented.

BENEFITS

The even more astute of you will have realised that numbers less than eight bits 'wide' can be represented in a number of ways: two, for example, could be two with a shift of zero or one with a shift of 15 – this is the inevitable redundancy of this system, but I think you'll agree the benefits far outweigh the problems. Listing two shows some examples of larger numbers. You won't be able to run this program as one of the lines causes an error – can you guess which one?

One final point relating to negative numbers, '-1' in binary is represented by all 1s (see last month's article). Fairly obviously, this is 32 bits 'wide' and therefore cannot fit into an eight-bit value field. By using the ones complement method, -1 becomes 0 which, as we all know, will easily fit into eight bits.

Next month I will look at the final instalment of `MOV` and explain what you do if you really *do* want to load 258!

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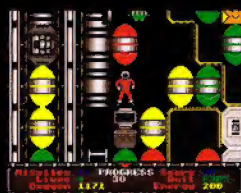


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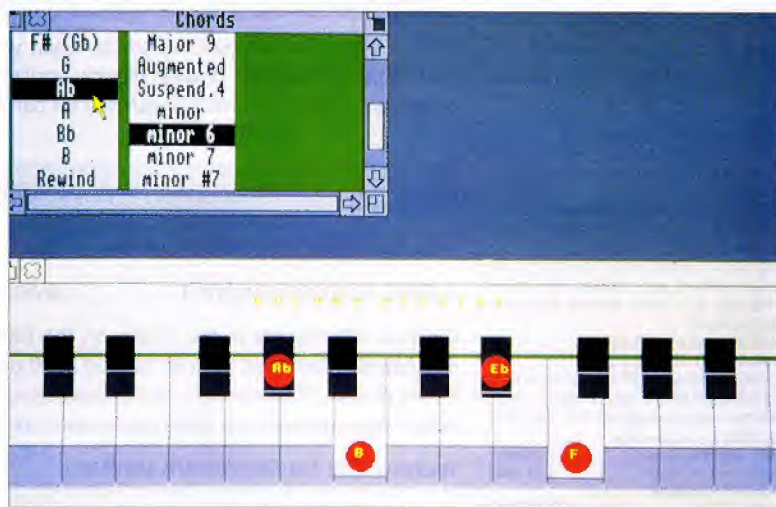
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WIN
A MUSIC
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SEE PAGE 120

Learn all about
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with **PAUL
MARSHALL's**
chord dictionary



STRIKE A CHORD

It is common knowledge that playing a one-fingered tune on a piano sounds pretty boring. To make a tune come alive you need to play a few well-chosen notes at the same time – notes which harmonise with the main theme.

Anyone who plays the piano will know that certain notes, when played together, form a chord. In published sheet music the accompaniment harmony is often shown using chord symbols. Guitar players are lucky – they sometimes even get a little drawing which shows them where to put their fingers.

Some years ago, when I felt that the world badly needed another guitar player, I learnt all the chords I needed using songbooks and diagrams in a chord dictionary. More recently, when I wanted to learn chords on a musical keyboard, I decided to enlist the help of my computer. Hence the birth of *Chords*.

The application *Chords* is a chord dictionary with built-in sound, but it also has a simple sequencing feature. Even if you are not learning to play, just listening to the different chords and the way they work together can be fascinating.

USING THE PROGRAM

The program installs on the icon bar in the usual way. Clicking select over the icon brings up two windows: one contains the music keyboard, the other the selection menus.

On the left are the 12 basic chord names from C through to B, plus control of the sequencing. In the centre there are 15 chord forms: the basic major and minor triads – triad means three notes – and a selection of higher forms. (If you are a bit hazy about your harmonies, then take a look at our box called natural progressions.)

Select the chord name, form and position from the menus, and the keyboard window will show which keys to press and what the notes are called. Meanwhile, the chord is played through the computer sound system and through a Midi interface and keyboard, if one is connected. Pressing Adjust makes a selection without running the demonstration.

Notes played on a Midi keyboard are also shown on the display so the player can confirm the correct fingering. However, don't play lots of notes very fast as this may leave the program behind and fill up the Midi buffer.

Each time the mouse is clicked on Play seq, the next chord in a predetermined sequence is played. To enter a sequence, click over enter to reveal a line of text which can be edited in the usual way. Rewind puts the sequence pointer back to the start and Help displays a reminder of the sequence notation.

When the Arpeggio option is ticked, chords are played with a delay between each note. This is not a true arpeggio but it makes the individual notes easier to hear. Delay sets the delay in centi-seconds – from five to 100 is reasonable.

THE LISTING

In the 32-bit version, the Wimp routines are fairly straightforward, with windows and menus defined within the program. The keyboard graphics are drawn by PROCdraw_screen and PROCplot (which draws one key only), by first calling PROCbackgd to direct all VDU driver output to a background sprite. The usual drawing commands are then used without having to refer to window co-ordinates. PROCforeground then directs output back to the normal screen. When the

YELLOW PAGES

As usual, this program is free to subscribers on the monthly disc, in both eight-bit and 32-bit versions. If you do not subscribe, you can still type in the program by turning to the Chords section in yellow pages.

The 32-bit user should type in listing one and save it as !Runimage in a directory called !Chords. Then create a Mode 12 sprite in Paint called !Chords, with the dimensions 34x17 and save it inside the !Chords directory as !Sprites. Using Edit create an Obey file and enter the following text.
!IRUN for Chords
WimpSlot -min 80K -max 80K
RUN <Obey\$Dir>.!Runimage
Save this Obey file as !Run inside the !Chords directory. Now double clicking on the !Chords icon in the directory viewer will run the application. Eight-bit users should type in listings three and four and save them as Chords1 and Chords2. Then CHAIN "Chords1".

window manager calls for a re-draw, the whole sprite can be quickly plotted at the appropriate screen co-ordinates. If the user decides to change desktop mode, while the program is running, then PROCdraw_screen redefines and re-draws the sprite.

The selection window is constructed entirely from icons (this method allows faster access than Wimp menus). The window manager numbers the icons in the order that they are defined, so there is no need to save the icon handle returned by SYS"Wimp_Createlcon". To determine what name, form or inversion has been selected, PROCprocess_icons merely checks icon% against a range and subtracts an offset.

The presence of an Acorn-compatible Midi interface is detected in FNmidi by setting a local error trap and then attempting to make a Midi SWI call. The note number used to Midi is K%+59, where K% is the key from 1 to 24. Change 59 to 47 to drop the sound one octave.

The data defining each chord is stored at the end of the program. For each form the root position is given first, then the three inversions, then the name for use in the menu. Our 24-note keyboard is numbered from one to nine then A to N, where 1 represents low C, 2 is C# and so on. Only chords in the key of C are stored; other keys are derived by adding an offset.

A more elegant approach would be to take the basic triad and alter or add to it, according to a formula. A whole range of altered chords could then be produced quite easily. Some notes have different names but sound the same, for instance C# and Db. Logic in PROCplay determines the appropriate name to print on the keys but it is not always grammatically accurate – another reason why the chord data would be better derived from a formula.

FNtoo_high checks if any note would be beyond the top range of the keyboard, in which case the whole chord is moved down by an octave. PROCplay_sequence processes the sequence text using INSTR to match the letters entered with those valid. No error checking is performed here. An unrecognised entry will default to a C or a major chord, depending on where the error is. You may need to alter *TUNING 80 in PROCinit_prog to adjust the pitch of your micro.

EIGHT-BIT VERSION

The eight-bit version works in a similar fashion. Selection is made using the cursor keys, a tick indicating the selected item. RETURN plays the chord and SPACE steps through the sequence.

Pressing 0 allows the sequence to be edited. Insert editing is provided, using CURSOR LEFT/RIGHT, and DELETE. Press RETURN when it is finished. As there are only three sound voices and many chords have four notes, notes are played one-at-a-time in arpeggio style.

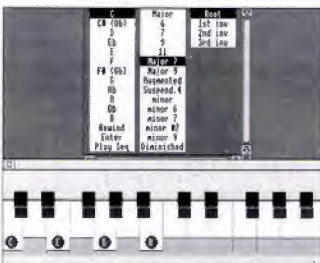
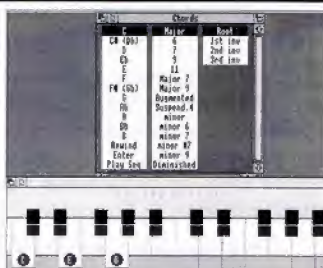
The program is in two parts. Chords contains instructions and sets PAGE to &1300 ready for Chords2. Data format is the same as for the 32-bit version, but there is only room on the screen for 14 chord forms, so the minor#7 has been omitted. To save space, the sequence string is indirectly by seq% to &A00. No Midi output is provided but could be added as indicated in PROCplay. Midi input is not included but a routine similar to PROCmidi_in could be added.

NATURAL PROGRESSION

The chord table below describes how to enter the traditional chord symbols into the program. (It uses the key of C as an example.) You can see that on the right of the program menu there are four positions: the root plus the first, second and third inversions. The note that the chord is named after is known as the root of the chord.

(Moreover, in a root chord – shown on the right – this note is also the lowest note in the chord.) Inversions are a re-arrangement using the same notes, but where the root is not the lowest note. To try out progressions, in other words a sequence of chords that lead naturally from one to another, the sequence option can be used. Chords built on F and G follow on from C pretty well.

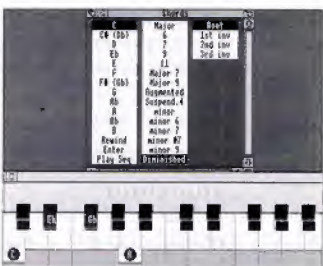
Numerous songs have been written with just C, F and G, known as the three chord trick, and some rock groups, such as Status Quo, have built whole careers playing little else.



happen. Now play F Major. The ear is satisfied. The C7 chord has resolved on to the F Major. Sharpening the fifth (that is, the fifth note up from the root) of a major chord gives an augmented triad, which tends to resolve on to a chord with a root a fourth above it's own, (try C plus F). Any note of the augmented can be the root and this applies also to the diminished chord. Compare Co Ebo F#o Ao with Co 1Co 2Co 3Co.

To hear a diminished chord at work, try C Co Dm7 G. Here, the diminished (see right) resolves into a minor, and the minor to G Major. Notice how it sounds unfinished.

Following on with the reverse, G Dm7 Co C gives a complete progression, but the two Gs together sound dull. Would Gsus4 be better than the second G? The minor sharpened seventh (m7# for short) is an example of an altered chord that definitely belongs in a mystery movie! Inversions, although containing the same notes, don't always have precisely the same effect. C major in the 1st inversion doesn't sound quite as final as the root position. Play C Major seventh (Cm7) in the root position and the notes look evenly spaced. Move to any of the inversions, and B and C pop up next to each other. Being adjacent, they sound discordant on their own, but in harmony with E and G, the sound is, well... judge for yourself!



CHORD TABLE

FORM	CHORD SYMBOL	ENTERED AS
Major	C	C
Minor	Cm or CMI	Cm
Seventh	C7	C7
Major seventh	Cmaj7 or CMA7	CM7
Minor seventh	Cm7 or CMi7	Cm7
Minor sharpened 7th	m7# or m(+7)	Cm#7
Augmented	Caug or C+	C+
Diminished	Cdim or Cdim7 or C°	Co
Suspended fourth	Csus or Csus4	Cs or Csus
(substitute 6,9,11 for 7 as required)		

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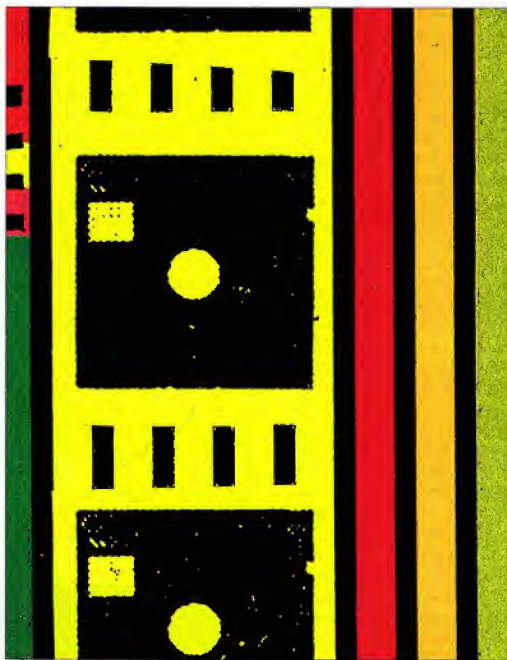
A TIGHT FIT

Laurie Jones of Bedford continues our curvy theme this month with *CurveFit*. This is a program which uses an iterative procedure to reduce the size of a formula which represents a curved line. Using an expression of x with two parameters, a and b it will fit any two parameter function of x . The menu gives a selection of functions which have proven useful, but allows the entry of any expression in the correct form: for example, $y = a + b/X$ or $y = a/(1 + b*X)$.

The usual method is to transform the data into a linear form and then to perform a linear regression. Unfortunately this gives unequal weightings to the data points, depending on the transformation used. By using the speed of the Archimedes to perform simple iterations, you can avoid the use of sophisticated curve-fitting algorithms for non-linear data, provided the theoretical curve is known. The basis of this program is sequentially to optimise the values of the a and b parameters, starting from initial 'guessed' values (the default value is one).

The x,y data set is read into an array, and the calculated value of y is found for each value of x . The observed y value is subtracted and the result squared. The squared values are summed for each x,y pair to give the initial sum of squares. The value of a is then decreased by 10 percent

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and the process repeated. If the sum of squares has decreased, a is again reduced and the process repeated. (Otherwise the direction of change in a is reversed and a is increased.)

This process is repeated until the sum of squares again increases. The direction of change is then reversed and the step size reduced to 1 percent. The iteration continues until the next overshoot; the step size is reduced to 0.1 percent and direction reversed again. This process continues until the step size is 0.00001 (which can be altered at will).

```
>Test
This is the heading
Label for X
Label for Y
0,0
10,20
20,30
30,35
40,37.5
50,38.75
```

Example data for curve fitting

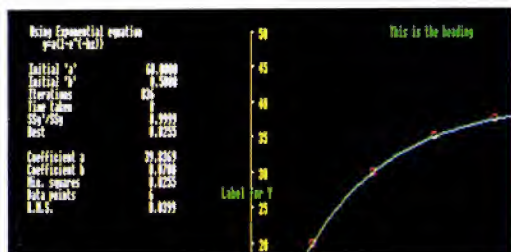
The same procedure is then run to optimise b . The cycle of optimising a and b alternately is continued for 50 cycles or until the ratio of the sum of squares of y on successive cycles is between 1.00001 and 0.99999 (again arbitrary). In principle the same system could be used to fit a third parameter, but the fitting process would be very slow.

The data should be stored in a previously prepared data file – the required format of the data file is described later. Once the data file has been read, the program plots out the data points on automatically scaled axes and then presents a menu containing a set of curve options, plus an option to enter any other function of x in terms of a and b . The iteration then proceeds, is monitored by a counter and timer, and the display of the ratios of successive sums of squares.

Provided the curve chosen is appropriate to the data, and sensible a and b values were

★ INFO COMPATIBILITY TABLE

LISTING	NAME	BBC B	MASTER	ELECTRON	ARC
Info 1	CurveFit				★
Info 2	Bezier8	★	★	★	
Info 3	BezDemo	★	★	★	★
Info 4	Toner27				★
Info 5	Point32				★
Info 6	Cube				★
Info 7	Hypno32				★
Info 8	Hypno8	★	★	★	★
Info 9	IRunImage				★
Info 10	Mortgage	★	★	★	★
Info 11	MindMaster2	★	★	★	★
Info 12	Scribe				★



The curve plotted by Curvefit to fit the example data

chosen, the iteration takes a few seconds to a minute or so, depending on the amount of data to be fitted.

The program then prints out the values of a and b and the function fitted, together with the residual sum of squares about the fitted line and the root mean square. The curve of best fit is then drawn on the plot of the original data points. By using a Mode 16 screen, it is possible to show the curve parameters and the fitted line on the same screen, and print it out if required. Next, an analysis of variance is produced, showing the total sum of squares for y , the sum of squares accounted for by the regression, and the residual sum of squares.

The variance ratio, F , gives an estimate of the significance of the fitted line for the number of degrees of freedom in the data. If the curve fitted was a straight line then the regression coefficient r is printed.

The main use of the program is to fit calibration curves to biochemical data and then to use these curves to calculate the concentrations of test samples. In setting up the calibration curve a set of samples of known concentration are used, and appropriate instrumental readings taken (for example, colour measurements, meter readings and radioactive counts).

The concentrations are plotted on the x axis, and the observed readings on the y axis. Once the curve is established, the values obtained from test samples are read, and the concentration determined from the calibration curve.

Although this would not be the method of choice for performing linear regressions,

comparison with the standard method gives the same values for the slope and intercept, and the same residual sum of squares to three or four decimal places, and could be made closer by increasing the number of iterations (modify the value of 'factor' at the end of PROCiterate and/or the limits at the end of PROCoptimise). No checks have been made with other curve fitting procedures.

As mentioned, data for the program should be stored in a file. This can be created using *Edit*. The file should contain a heading for the graph, a label for the x -axis and a label for the y -axis (maximum of four characters) on separate lines followed by the data in the form of x,y pairs, one per line.

Blank lines and lines beginning with a semi-colon are ignored, so you can add in comments if you want as shown in our example file (on the previous page). If you're feeling particularly unctuous you might like to SetType your file to a CSV and load the file into a spreadsheet!

There are some datasets that will confuse the program, especially if the function you are trying to fit is inappropriate, or the original guesses of a and b were a long way out.

For some functions of x , it will find false optima, where the sum of squares seems to be at a minimum. In these cases an obviously silly line may be plotted. In particular, re-entrant functions such as parabolas or trigonometric functions (sine or cosine etc) seem to confuse it.

You can speed up the iterations by omitting the monitoring of the process - there are two calls to PROCmonitor in PROCoptimise. It is quite fun to

watch the successive attempts at fitting the curve by putting in an extra call to PROCdraw in either the PROCoptimise just after `optloop=1`. To really see what's going on, you could try adding a call within the REPEAT loop of PROCiterate, but it will drastically slow things down!

★ PRIZE £50 ★

FAST CORNERING

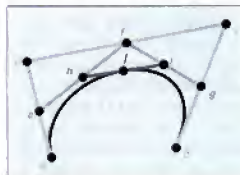
Our coveted star prize this month goes to **David Breakwell** of Addlestone. Prompted by the *Pieces of Eight* revival of Bezier curves (*BAU* December 91), he has rattled off a speedy curve plotter for eight-bit machines. As you may or may not know, there are two ways of drawing Bezier curves. The simplest is the parametric method as used by George Blanchard in *Pieces of Eight*. This is a nice, concise method that can be easily translated into Basic and involves a third variable, usually t , that varies from 0 at the start of the curve to 1 at its end. Values for both x and y are calculated from t .

Another way of plotting Beziers is to use a recursive sub-division or 'divide and conquer' method. The advantage of this is that it can use integer arithmetic throughout. The only maths involved is a divide by two which can be performed with a simple right shift on the 6502 processor. The recursion works according to the following rules.

'To plot a Bezier curve using points a, b, c and d , where a and d are the start and end points and b and c are the two control points, calculate the mid points of ab, bc and cd (call these e, f and g). Then calculate the mid points of ef and fg (h and i). Finally calculate j , the mid point of hi . Then plot the two 'sub' Bezier curves $aehj$ and $jigd$. This should, of course, be done recursively.'

Our diagram below should make this clear. To stop the recursion a 'depth' should be passed down the calls and once this reaches a predefined level, the straight line ad will be drawn instead of recursing. Alternatively, and more efficiently, a quick check could be made at the start of the routine on the length of this line segment and the recursion then only takes place if it is longer than, say, four pixels.

We've knocked up a demonstration, entitled *BezDemo*, that plots a curve using parametric and recursive methods.



Drawing a bezier curve using a recursive sub-division method. All points e-j are mid points. Each sub-division generates one more point (j) that is guaranteed to be on the curve.



Fast corners plotted by our eight-bit routine

As David's machine code version uses operating system VDU calls to do the plotting, it will work on any eight-bit machine in any mode, including shadow modes. This does, of course, mean that it might not run as fast – directly accessing the screen memory would be quicker – but it does remove the need for complicated bounds checking for the edge of the screen and graphics window. Also it makes this version independent of screen mode.

David has included a short demonstration of his code in the listing, that merely plots random curves. From this demo, the way that you use the program should be fairly self-explanatory.

For curiosity value only, he has also sent in a routine that renders Risc OS Draw files on a BBC. For those interested, this can be found on the monthly subscribers' disc. Needless to say, it doesn't handle line widths, filled shapes, colours, text, sprites...

★PRIZE £20★

UNITED COLOURS..

Jan Vibe, was the author of *Fire and Spikes* (BAU March 92) and Jan returns this month with a very nice seven line procedure for Arc users. The offering called *Toner27* generates eight shades of 27 colours in 256 colour modes. The layout of the 256-colour palette is the bane of many peoples' lives, so it's nice to see a short way of making sense of all those hues!

Jan has provided four routines, by way of demonstration



An impressive cube program: described in our plot spot graphics guide

and he earns a fiver for each! Oh, and by the way, you'll need to save the output from three of these routines for Mr Acton's *Cube* further on, so be sure to press S when the program boots between each section. Incidentally, when you run the program, there is one example of a recursive flower, which you have to stop by pressing SPACE.

PLOT SPOT

From our reader survey it seems that many of you would like some back-to-basics stuff, to assist you with Basic and machine-code programming. We'll try to respond as best we can to these and other comments from the survey in future issues. **M J Ballinger** of Cirencester has asked how to plot a point on the screen of an Archimedes using machine-code. This being the basis of literally dozens of items in past ★INFO articles, we thought it would be a good point to kick off with, so have a look at *Point32*.

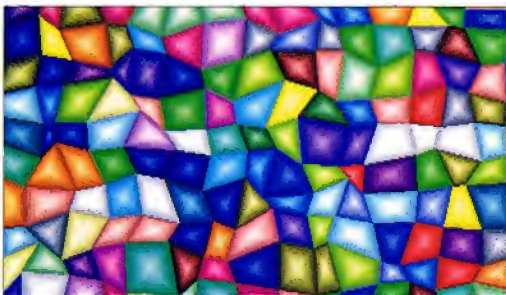
You can plot points using the Basic keyword *POINT* or by using 'official' calls. However, it is much quicker to 'poke' points directly into the screen memory. The screen of the Archimedes is arranged very simply and 256-colour modes

		Columns			
		0	1	2	3
Rows	0	0	1	2	3
	1	320	321	322	323
	2	640	641	642	643
	3	960	961	962	963

Layout of the Archimedes' mode 13 screen memory

are particularly easy to deal with. This is why so many of our demos run in modes 13 or 15 and *Point32* uses a 256-colour mode for precisely the same reason.

That reason is that in mode 13, for example, each point on the screen is represented by a single byte. You simply choose the colour you want from the 256 available, work out which byte you want to poke and put that value there. Each row of pixels



Colour plotting made easy with the *Toner27* routine

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(starting with the top one) consists of a block of consecutive bytes of memory as shown in the previous diagram.

In mode 13 there are 320 pixels across the screen, so the top row occupies bytes zero to 319 of screen memory. The next row follows on directly from this, so it takes up bytes 320 to 639. The next uses 640 to 959.

Unlike the BBC however, it is not always obvious where the screen starts in memory. It depends on how much of your machine's Ram is allocated to the display. There is a call which allows you to find the address of the top left corner of the screen though (column zero, row zero in figure one) and this is `OS_ReadVduVariables`.

It takes two parameters – the first points to a list of numbers terminated with one. The numbers are the codes for the VDU variables you want to read.

Code 148 means the start of screen as used by `PLOT` and `DRAW`. The second parameter points to where you want the values returned to be placed. It may be the same place, as in the example, if you're only going to read them once.

The plot routine in the example is called `.plot` and takes three parameters. In registers R0 and R1 (taken from A% and B% in Basic) are placed the co-ordinates of the point to plot. Note that these are not OS co-ordinates but 'raw' values (x in the range 0-319, y in the range 0-255). The colour to plot is passed in R2 (C%). To calculate the screen address, we use the simple formula: `address = base + y x linewidth + x`.

The value base has been

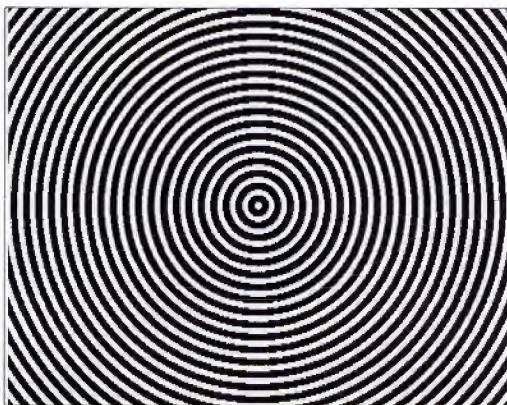
read with `OS_ReadVduVariables` and `linewidth` is 320 for mode 13. We could use a multiply instruction to calculate the address of our pixel, but because $320 = 256 + 64$, we can use two shifts instead and this will be much quicker. Also, we don't need to add on the x because we can incorporate this into the `STRB` instruction that places our colour on the screen. The example plots a line of randomly coloured points by repeatedly calling `.plot`. For speed, you would normally reserve a register to permanently hold the start of screen address, so it need not be reloaded each time.

Having looked at machine-code graphics at their simplest, let's take a bit of a leap and see what else can be done. *Cube* uses the same principles as *Point32* – mode 13 is used for speed and simplicity.

Three pictures are loaded and then mapped on to the surfaces of a rotating cube. Since it was readily available, we have used the output of Jan Vibes' *Toner27* and saved them as mode 15 screens with the names *pic_tree*, *pic_flower* and *pic_tiles*. Alter the listing if you want to use other sprites – any 256-colour ones will do, whatever their size.

The program uses a cheat to perform the 'squashing' of the sprites into arbitrary quadrilaterals. The technique is fast and simple, and convincing enough if the sprite is not stretched too wildly! Our example shows the basic idea, with a sprite ABCD being mapped on to A'B'C'D'.

To do this properly would mean applying a transformation to each pixel in turn and



BAU Health Warning: not a program to run when you have a hangover

this would take many seconds. Instead, we find the lowest point in A'B'C'D' – B' in fact. Then we move up the shape a row at a time. With each row we see how far along B'A' we are, and how far along B'C'.

We then mark points with the same proportions along BA and BC and draw a line between them. Finally, we simply take this line and stretch it or squash it, so that it fits on the current row we are plotting, then move up another line and repeat the process.

Eventually we reach the row that C' lies on. We take note of this and continue upwards. We're still moving along B'A' on the left, but are now moving along C'D' on the right. Again, we take points from the original shape that are the same proportions along BA and CD, draw a line and map it on to our new shape. A little further up we encounter A' on the left, so start moving along A'D' on that side, continuing along C'D' on the right. Finally we reach the top.

Because we're plotting actual rows on the screen, we can use fast store and multiple-store instructions. Also, because we are only concerned with each point on the final image, holes will be filled in if the image is bigger than the original and smaller versions will be plotted more quickly.

The cheat becomes apparent if you stretch one corner a great deal – a fold will appear in the image. The picture is not really treated as a single piece

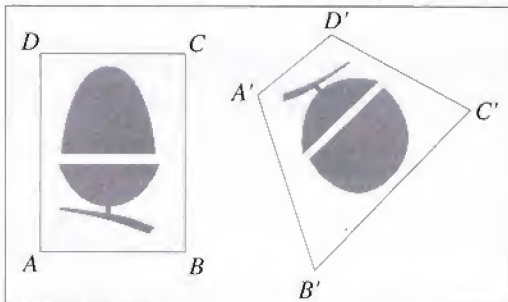
of rubber (which would be ideal) but as several pieces joined together. Still, the effects are good enough, and the speed is sufficiently fast to make the routine useable in real-time.

★PRIZE £10★ LOOK INTO MY EYES

B This program was an absolute hit in the BAU office. It's a one-liner from **Richard Boakes** and it shows you just what a strange effect your own eyes can produce. *Hynpo* (there are two versions: one for eight-bit and another for 32-bit machines) draws a pattern of concentric circles – alternately black and white. These are then animated so the pattern appears to move inwards. 'Stare at the centre for 15 seconds or more' says Richard, 'and watch your eyes play tricks on you. Look around the room!'

★PRIZE £25★ UPTIME

B Have you ever wanted to know if someone has been tinkering with your machine while you've been out? Or have you ever wanted to know how long you use your machine a day? **Ron Wardenier** from Drachten in the Netherlands has sent in a handy little application that sits in your boot up sequence and keeps a track of exactly



Squashing a rectangle



```
> !Boot
!Boot file for UpTime
By Ron Wardenier
(C) BAU April 1992
```

```
IconSprites
<Obey$Dir>.!Sprites
```

```
> !Run
!Run file for UpTime
By Ron Wardenier
(C) BAU April 1992
```

```
IconSprites
<Obey$Dir>.!Sprites
Set UpTime$Dir
<Obey$Dir>
Set UpTimeFlag ?
RMensure UpTimeLogger
1.00 Set UpTimeFlag Off
If UpTimeFlag="Off" Then
Run
<UpTime$Dir>.!RunImage
Unset UpTime$Dir
Unset UpTimeFlag
```

!Boot and !Run files for UpTime

that, *UpTime* keeps a record of when you have used your Arc and can also be used to detect usage of the given Arc in your absence. However anyone who is able to manipulate text files could cover their trail, so be warned! Once installed and

included in an autoboot sequence, *UpTime* is completely transparent.

Recording the time of starting work is quite easy. Just after switching on - or going up as we will call it - *UpTime* is run as part of the autoboot sequence. As well as other actions, *UpTime* then reads the RTC (Real Time Clock) and writes its value to a file. This file called *UpTimeLog* acts as a simple kind of logbook.

Not surprisingly, the time of going down (in other words, switching off) is not as easy to record. If you are very disciplined you could write some kind of closing down sequence and execute it every time you stop work. Part of such a sequence could be a program that writes the RTC-time to the file *UpTimeLog* but, of course, it is far more convenient to have the time of going down recorded automatically.

To achieve this, *UpTime* continuously writes the time of the RTC to Cmos Ram. The data in Cmos Ram is preserved by battery when the Arc is off.

So, at the next time of going up *UpTime* reads the time in Cmos Ram and writes it to the file *UpTimeLog*. This time represents the time of going down because it was the last one written in Cmos Ram.

To reduce the load on the processor, writing the RTC time to Cmos Ram is limited to once a minute. By doing so, the resolution of the recorded time is also one minute. Care is taken to perform proper rounding off when converting centiseconds to whole minutes. Again, to reduce the processor load, no use is made of *Wimp_Poll* or *Wimp_PollIdle*.

The *Wimp* desktop polling mechanism is not used for two reasons. Firstly, the writing to Cmos Ram would grind to a halt if you left the desktop. Secondly, general polling is a rather inefficient method. Risc OS itself provides the perfect solution by means of a couple of SWIs, namely *OS_CallEvery* and *OS_RemoveTickerEvent*.

OS_CallEvery is used to install an interrupt routine on a timer chain. Once installed, the rou-

time is called repeatedly after every fixed time interval. *OS_RemoveTickerEvent* is used to remove the routine from the timer chain. *UpTime* uses *OS_CallEvery* with a time interval of 6000 centiseconds (one minute). In this way, once a minute, action is taken in the form of writing the RTC-time to Cmos Ram and the Arc is not slowed down by running yet another desktop task in the background.

In Cmos Ram, the locations 30 to 45 are reserved for the user. The time and date of the RTC can be stored as a five byte value. Obviously, claiming five of the sixteen locations available is too much. Instead of storing the absolute time and date, a relative time is used which requires only two locations in Cmos Ram. With the minute as a unit of time, just over six and a half weeks can be stored in these two bytes. Anything relative must be fixed to something absolute. In this case the relative time starts ticking from a reference time.



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To allow the RTC to be set a little backwards, the reference time is the time of going up, minus one week. As a consequence, the maximum period of staying up, in which all timekeeping makes sense, is limited to about five weeks. There is no need to worry should this period be exceeded since nothing dramatic will occur. Everything will go on except the time of going down will be calculated incorrectly as the reference time will no longer be valid.


The part of *UpTime* responsible for updating the CMOS Ram every minute, is held in a relocatable module called *UpTimeLogger*. This module is assembled every time *UpTime* is run, because the reference time must be known to the code in order to convert the RTC time to the two-byte relative time.

Therefore, the module is not saved to disc but transferred directly to the RMA by using OS_Module with R0 set to 11. The module help string contains the date of assembly but

the version string stays fixed to one. The figures on the previous page contain the *!Boot* and *!Run* files and should be entered using *Edit* and saved in a directory called *!UpTime*. The main listing, *!RunImage*, is on the yellow pages. You will also need to create a suitable sprite with *Paint* and save it in the *!UpTime* application directory. The actual logbook file *UpTimeLog* and the reference file *UpTimeRef* are not listed. These files are created and updated by the application.

★ PRIZE £15 ★


SPYROGYRA

 Scribe has come all the way from sunny Australia, **Sam Watkins** of Victoria to be precise. The function, operation and results of Sam's program should be self explanatory: the program as listed has been tweaked a bit from Sam's original. His version flickered quite badly as he only used one screen bank, but note the

horrible contrivances (especially in *PROCdraw*) needed to make it work with two! Multi-sync owners may like to change the *MODE 15:MODE 12* to *MODE 21:MODE 20*.

★ PRIZE £15 ★

MASTERMIND TWO

 In January's *★INFO*, we carried a neat little Mastermind program by J A McHugh. We also asked if any bright reader could come up with a good computer-play routine. One who did is **Malcolm Gray** and we've merged his thinking routine with J A McHugh's original to produce a complete game. You can now take turns with the computer, guessing its randomly chosen code and then choosing a code of your own for it to work out. Although it may be tempting, the computer doesn't cheat and instead uses a 'brute force' method to work out your combination. Essentially, all possible combinations are stored in an array and are

'crossed off' if they contradict the results of previous guesses.

The computer usually manages to get the right answer within eight guesses and a score is kept. Ten points are awarded for guessing at the first attempt, nine for two guesses, eight for three and so on. You might like to enhance the thinking process by adding a random element. Currently, the computer will always choose the same strategy, so if you discover a code that it has trouble with, it's up to your good sportsmanship not to repeat the formula in every game!

*QUIT

Please send any submissions to us at the following address:

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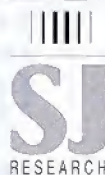
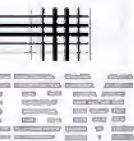
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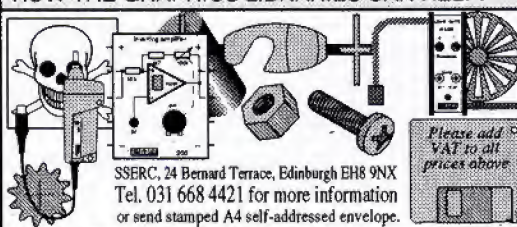
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Program	Page	BBC B B+	B+/ 128	Master 128	Master Compact	Electron	6502SP/ Turbo	ADFS	Econet	Shadow Ram	Archimedes/ A3000/A5000	Monthly disc
★Info												
Info 1												
Info 2-3		■		■	■	■			■	■		■
Info 4-7												
Info 8		■	■	■	■	■			■	■		
Info 9												
Info 10		■	■	■	■	■			■	■		
Info 11		■	■	■	■	■			■	■		
Info12												
Facebender												
Face 1-2												
Face 3-5		■	■	■	■	■			■	■		■
Chords												
Chords1								■	■	■	■	■
Chords 2-3		■	■	■	■	■			■	■		■
Arm Programming												

★Info

Listing 1

10 REM %CurveFit (Info1)	780 VDU 4	1570 CASE eqn OF	2370 ca=c+a/factor
20 REM By Laurie Jones	790 ENDPROC	1580 WHEN 2:	2380 ELSE
30 REM For RISC OS machines	800 :	1590 a=1.2*Fmax(1)	2390 ch=cb/b/factor
40 REM (C) BAO Apr 92	810 DEF PROCPlot	1600 b=0.2*Fmax(2)	2400 ENDIF
50 :	820 OCUL 1	1610 WHEN 2:	2410 neweq=Fnewq/cb
60 ON ERROR VDU4:CLOSE#0:GOTOIN 0,0,0	830 FOR i=1 TO points	1620 a=1.2*Fmax(1)	2420 IF neweq>oldq factor=10*factor
70 "Hourglass Off":PRINTREPORT2:" at lin	840 CIRCLE data(1,1)*1100/scalex,data(1630 b=0.2*Fmax(2)	2430 oldq=oldq
80 "ERL:CM ERROR OFF:END	1,1)*1100/scaley,10	1640 WHEN 3:	2440 UNTIL factor>10000
90 PROC=dequations	850 NEXT	1650 b=(Fmax(2)-Fmin(2))/(Fmax(1)-Fmin(1))	2450 ENDPROC
100 DIM data(100,2)	860 DEF PROCChoice	1660 sub=Fmin(2)-Fmin(1)	2470 DEF PROCminimize(newq)
110 PROC=oldfile	870 :	1670 MODN 4:	2480 IF maxeq<0 THEN
120 VDU 28,0,31,42,0	880 PRINT "Select Expression for curve	1680 a=1.2*Fmax(1)	2490 PRINTTAB(0,5)"Iterations",FForm(1
130 eqn=0	to be fitted "	1690 b=0.5	2500 PRINT "Time taken",FForm(TIME DIV
140 PROC=	900 FOR i=1 TO eqns	1700 WHEN 5:	2510
150 PROCPlot	910 PRINT i;" "	1710 a=3	2520
160 PROCChoice	920 PRINT "0) Other function of X in t	1720 b=(Fmax(1)+Fmin(1))/2	2530 PRINT "best",FForm(best)
170 CLS:CLS	930 PRINT "Select: "	1730 WHEN 4:	2540 ENDIF
180 PROC=	940 PRINT "Repeat: "	1740 a=0.5	2550 ENDPROC
190 PROCPlot	950 REPEAT	1750 b=1.5*Fmax(1)	2560 DEF PROCdraw(a,b,scalex,scaley)
200 PROC=eqn	960 key\$=GET\$	1760 WHEN 0:	2570 LOCAL x,y
210 VDU 38	970 UNTIL key\$="0" AND key\$="6"	1770 REPEAT	2580 IF eqn=5 THEN
220 CLS	980 eqn=VALkey\$	1780 UNTIL "Estimate of a"=a	2590 x=Fmin(1):y=EVAL(y\$)
230 PRINT "Using "	990 x=x+(eqn)	1790 UNTIL b=0	2600 ELSE
240 IF eqn=0 PRINT "other:": ELSE PRIN	1000 y=y+(eqn)	1800 CLS	2610 ENDIF
250 PRINT "equation"	1010 IF eqn=5 THEN	1810 ENDCASE	2620 OCUL 6
260 IF eqn=0 PRINT "y=y\$": ELSE PRI	1020 NDB=DATA(1,2)+data(2,2))/2	1820 ENDPROC	2630 FOR i=1 TO 100
270 "eqn\$eqn"	1030 data(1,2)=NDB	1830 LOCAL a,x,y,ocal	2640 xx=x+scalex/100
280 PRINT "Initial "a";FForm(a)	1040 data(2,2)=NDB	1840 sumsq=0	2650 y=EVAL(y\$)
290 oldq=Fnewq(a,b)	1050 start=0	1850 FOR i=1 TO points	2660 NEXT
300 maxsq=oldq	1060 B=DATA(1,2)+data(4,2))/2	1860 yocal=EVAL(y\$) : REM use a and b	2670 OCUL 5
310 TIME=0	1070 data(1,2)=B	1870 dif=eqn(data(1,2)-yocal)^2	2680 LINE 0,a*900/scalex,1100,a*900/sca
320 OFF:SYS "Hourglass_On"	1080 FOR i=1 TO 4	1880 sumsq=sumsq+difq	2690
330 PROC=oldfile	1090 data(1,1)=1	1890 LOCAL i	2700 WHEN 1
340 SYS "Hourglass Off"	1100 data(1,1)=LOG(data(1,1))	1900 DEF Fmin(2)	2710 LINE 0
350 PROC=draw(a,b,scalex,scaley)	1110 NEXT	1910 LOCAL i	2720 LINE 0
360 PROC=Output	1120 FOR i=1 TO points	1920 maxdata(1,2)	2730 LINE 0
370 PROC=	1130 data(1,1)=LOG(data(1,1))	1930 FOR i=1 TO points	2740 LINE 0
380 END	1140 NEXT	1940 maxsq=0	2750 WHEN 6
390	1150 ELSE	1950 LOCAL i	2760 LINE 0
400 DEF Fmaxor	1160 start=1	1960 maxdata(1,2)	2770 LINE 0
410 IF ERR=18 OR ERR=22 I=1:I=1:TRUE	1170 ENDIF	1970	2780 LINE 0
420 PRINT REPORT2:" at line "ERL	1180 IF eqn=5 THEN	1980 maxsq=0	2790 LINE 0
430 CLS	1190 PRINT "Enter function of x"	1990 FOR i=1 TO points	2800
440 :	1200 INPUT "y=y\$"	2000 IF data(1,2)=max maxsq=data(1,2)	2810 DEF Fmin(2)
450 DEF PROC=	1210 ENDIF	2010 NEXT i	2820 LOCAL a,x,y,ocal
460 LOCAL x,y,i	1220 CLS	2020	2830 mindata(1,2)
470 VDU 5	1230 ENDPROC	2030 mindata(1,2)	2840 FOR i=1 TO points
480 ORIGIN 800,110	1240 :	2040 minsq=0	2850 IF data(1,2)=min minsq=data(1,2)
490 OCUL 7	1250 DEF Fmaxxline	2050	2860 minsq=0
500 LINE 0,0,1100,0	1260 LOCAL line\$	2060 DEF Fmin(2)	2870 CASE eqn OF
510 LINE 0,0,0,500	1270 REPEAT	2070 LOCAL i	2880 WHEN 1
520 x=INT(Fmax(1))	1280 line\$=GET\$in	2080 FOR i=1 TO points	2890 PRINT "Min. square",FForm(newq)
530 y=INT(Fmax(2))	1290 UNTIL line\$="" AND LEFT\$(line\$,1)	2090 minsq=0	2900 PRINT "Data points",FForm(points)
540 IF x=0 a=1 ELSE scalex=INT(LOG(x))	1300 line\$	2100 min	2910 PRINT "R.M.S.",FForm(SQR(newq)/p
550 IF y=0 a=1 ELSE scaley=INT(LOG(y))	1310 ENDPROC	2110	2920 PRINT "b",FForm(b)
560 scalex=INT(10*scalex)	1320 :	2120	2930 PRINT "a",FForm(a)
570 scaley=INT(10*scaley)	1330 DEF PROC=oldfile	2130	2940 PRINT "x",FForm(x)
580 scalex=scalex/INT(scalex/Fmax(1))	1340 CLS	2140	2950 PRINT "y",FForm(y)
590 scaley=scaley/INT(scaley/Fmax(2))	1350 REPEAT	2150	2960 PRINT "b",FForm(b)
600 FOR i=1 TO 11	1360 UNTIL "Name of data file (or 'com	2160	2970 PRINT "a",FForm(a)
610 OCUL 7	and) " file\$	2170	2980 PRINT "x",FForm(x)
620 MOVE 110*(i-1),0	1370 IF LEFT\$(file\$,1)="" THEN	2180	2990 PRINT "y",FForm(y)
630 DRAW 110*(i-1),0	1380 OCUL 1	2190	3000 PRINT "b",FForm(b)
640 MOVE 110*(i-1)-20,-25	1390 ENDIF	2200	3010 PRINT "a",FForm(a)
650 OCUL 3	1400 line\$=GET\$in	2210	3020 PRINT "x",FForm(x)
660 IF eqn=5 PRINT INT(10*scalex*(1-1	1410 title\$=Fmaxxline	2220	3030 PRINT "y",FForm(y)
110)) ELSE PRINT scalex*(1-1)/10	1420 xlabel\$=Fmaxxline	2230	3040 PRINT "b",FForm(b)
670 OCUL 7	1430 ylabel\$=Fmaxxline	2240	3050 PRINT "a",FForm(a)
680 MOVE 0,190	1440 REPEAT	2250	3060 PRINT "x",FForm(x)
690 DRAW 8,190	1450 UNTIL points=0	2260	3070 PRINT "y",FForm(y)
700 MOVE 110,190+0	1460 POINT=0	2270	3080 PRINT "b",FForm(b)
710 OCUL 3	1470 POINT=0	2280	3090 PRINT "a",FForm(a)
720 PRINT scalex/10	1480 x\$=Fmaxxline	2290	3100 PRINT "x",FForm(x)
730 NEXT	1490 data(points,1)=VALY\$	2300	3110 PRINT "y",FForm(y)
740 OCUL 2	1500 data(points,2)=VALMID\$(x\$,INSTR(x	2310	3120 PRINT "b",FForm(b)
750 MOVE 500,-80:PRINT xlabel\$	1510 UNTIL BO\$in	2320	3130 PRINT "a",FForm(a)
760 MOVE -100,500:PRINT ylabel\$	1520 CLOSE Min	2330	3140 PRINT "x",FForm(x)
770 MOVE 500,510:PRINT title\$	1530 CLS	2340	3150 PRINT "y",FForm(y)
	1540 ENDPROC	2350	3160 PRINT "b",FForm(b)
	1550 :	2360	3170 PRINT "a",FForm(a)
	1560 DEF PROC=eqn	2370	3180 PRINT "x",FForm(x)


```

3130 dataeq=(data(i)*data(i))
3140 FOR I=1 to 100 TO points
3150 sumsq=dataeq(i,i)
3160 sumsq=dataeq(i,i)
3170 sumsq=dataeq(i,i)
3180 sumsq=dataeq(i,i)
3190 sumsq=dataeq(i,i)
3200 NEXT
3210 sumsq=sumsq/2*(points-start+1)
3220 sumsq=sumsq/2*(points-start+1)
3230 df=points-start
3240 residualss=sqsum
3250 regressionss=sqsum
3260 residualdf=df-1
3270 regressiondf=df-1
3280 regressionss=regressionss/df
3290 residualss=residualss/df
3300 IF maxsq<P=9999 ELSE P=regressionss/residualss
3310 IF maxsq<P THEN P=regressionss/residualss
3320 IF P<1 THEN P=1
3330 PRINTTAB(0,20);"ANALYSIS OF VARIANCE"
3340 PRINT"Residual sum sq"/PFORM(regressionss)
3350 PRINT"Regression sum sq"/PFORM(residualss)
3360 PRINT"Total sum of sq"/PFORM(sumsq)
3370 PRINT"Residual mean sq"/PFORM(residualss/df)
3380 PRINT"Regression mean sq"/PFORM(regressionss/df)
3390 PRINT"Residual d.f"/PFORM(df)
3400 PRINT"Regression d.f"/PFORM(df)
3410 PRINT"Total d.f"/PFORM(df)
3420 IF eq=1 PRINT"Correlation coeff"/PFORM(r)
3430 ENDPROC
3440
3450 DEF PFORM(n)
3460 n=INT(n)
3470 n=INT(n)
3480 n=INT(n)
3490 n=INT(n)
3500 n=INT(n)
3510 n=INT(n)
3520 n=INT(n)
3530 n=INT(n)
3540 n=INT(n)
3550 n=INT(n)
3560 DEF PROCdequations
3570 DATA eqns
3580 DIM name$(eqns),eqn$(eqns),a$(eqns),b$(eqns)
3590 FOR eqn=1 TO eqns
3600 READ name$(eqn),eqn$(eqn)
3610 READ a$(eqn),b$(eqn)
3620 NEXT
3630 ENDPROC
3640
3650 DATA 6
3660 DATA Michaelis-Menten,y=a/(b+x)
3670 DATA "a"/b
3680 DATA "a"/b
3690 DATA Antibody binding,y=a/(b+x)
3700 DATA "a"/b
3710 DATA "a"/b
3720 DATA Linear plot,y=a+b*x
3730 DATA "a"/b
3740
3750 DATA Exponential,y=a*(1-e^(-b*x))
3760 DATA "a"/b
3770
3780 DATA Logistic,y=(b/(1+EXP(-a*(x-c))))
3790 DATA "a"/b
3800
3810 DATA Sigmoidal,y=a/(1+EXP(-b*(x-c)))
3820 DATA "a"/b

```

Listing 2

```

30 REM Bezier8 - M/C Bezier Curves (Info)
20 REM By David Brewster
30 REM For Eight bit machines
40 REM (C) RAD Apr 1992
50
60 WDT 12.31;800;0;0;0;0
70 DIM coord$(8,mem$ 950,int$ 5)
80 coord$=PPE
90 coord$=PPE
100 coord$=PPE
110 coord$=PPE
120 coord$=PPE
130 coord$=PPE
140 coord$=PPE
150 coord$=PPE
160 coord$=PPE
170 coord$=PPE
180 coord$=PPE
190 coord$=PPE
200 coord$=PPE
210 coord$=PPE
220 coord$=PPE
230 coord$=PPE
240 coord$=PPE
250 coord$=PPE
260 coord$=PPE
270 coord$=PPE
280 coord$=PPE
290 coord$=PPE
300 coord$=PPE
310 coord$=PPE
320 coord$=PPE
330 coord$=PPE
340 coord$=PPE
350 coord$=PPE
360 coord$=PPE
370 coord$=PPE
380 coord$=PPE
390 coord$=PPE
400 coord$=PPE
410 coord$=PPE
420 coord$=PPE

```

Listing 3

```

50 REM BezierDemo (Info)
20 REM By David Lawrence
30 REM For all machines
40 REM (C) RAD Apr 1992
50
60 WDT 12.31;800;0;0;0;0
70 DIM x$(4),y$(4)
80 DIM x$(4),y$(4)
90 DIM x$(4),y$(4)
100 DIM x$(4),y$(4)
110 DIM x$(4),y$(4)
120 DIM x$(4),y$(4)
130 DIM x$(4),y$(4)
140 DIM x$(4),y$(4)
150 DIM x$(4),y$(4)
160 DIM x$(4),y$(4)
170 DIM x$(4),y$(4)
180 DIM x$(4),y$(4)
190 DIM x$(4),y$(4)
200 DIM x$(4),y$(4)
210 DIM x$(4),y$(4)
220 DIM x$(4),y$(4)
230 DIM x$(4),y$(4)
240 DIM x$(4),y$(4)
250 DIM x$(4),y$(4)
260 DIM x$(4),y$(4)
270 DIM x$(4),y$(4)
280 DIM x$(4),y$(4)
290 DIM x$(4),y$(4)
300 DIM x$(4),y$(4)
310 DIM x$(4),y$(4)
320 DIM x$(4),y$(4)
330 DIM x$(4),y$(4)
340 DIM x$(4),y$(4)
350 DIM x$(4),y$(4)
360 DIM x$(4),y$(4)
370 DIM x$(4),y$(4)
380 DIM x$(4),y$(4)
390 DIM x$(4),y$(4)
400 DIM x$(4),y$(4)
410 DIM x$(4),y$(4)
420 DIM x$(4),y$(4)
430 DIM x$(4),y$(4)
440 DIM x$(4),y$(4)
450 DIM x$(4),y$(4)
460 DIM x$(4),y$(4)
470 DIM x$(4),y$(4)
480 DIM x$(4),y$(4)
490 DIM x$(4),y$(4)
500 DIM x$(4),y$(4)
510 DIM x$(4),y$(4)
520 DIM x$(4),y$(4)
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660 DIM x$(4),y$(4)
670 DIM x$(4),y$(4)
680 DIM x$(4),y$(4)
690 DIM x$(4),y$(4)
700 DIM x$(4),y$(4)
710 DIM x$(4),y$(4)
720 DIM x$(4),y$(4)
730 DIM x$(4),y$(4)
740 DIM x$(4),y$(4)
750 DIM x$(4),y$(4)
760 DIM x$(4),y$(4)
770 DIM x$(4),y$(4)
780 DIM x$(4),y$(4)
790 DIM x$(4),y$(4)
800 DIM x$(4),y$(4)
810 DIM x$(4),y$(4)
820 DIM x$(4),y$(4)
830 DIM x$(4),y$(4)
840 DIM x$(4),y$(4)
850 DIM x$(4),y$(4)
860 DIM x$(4),y$(4)
870 DIM x$(4),y$(4)
880 DIM x$(4),y$(4)
890 DIM x$(4),y$(4)
900 DIM x$(4),y$(4)
910 DIM x$(4),y$(4)
920 DIM x$(4),y$(4)
930 DIM x$(4),y$(4)
940 DIM x$(4),y$(4)
950 DIM x$(4),y$(4)
960 DIM x$(4),y$(4)
970 DIM x$(4),y$(4)
980 DIM x$(4),y$(4)
990 DIM x$(4),y$(4)

```

```

560 x(x,y)=80*x+40*ND(60)-30
570 y(x,y)=80*y+40*ND(60)-30
580 NEXT
590 NEXT
600 FOR y=0 TO 13
610 FOR x=0 TO 16
620 x=(x+y)*x*(x+1)+y*(x+1)+x*(x+1)
630 y=(y+x)*y*(y+1)+x*(y+1)+y*(y+1)
640 NEXT
650 NEXT
660 PROCcol(col,int)
670 FOR i=0 TO 7
680 x=(x+int)*x*(x+1)
690 y=(y+int)*y*(y+1)
700 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
710 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
720 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
730 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
740 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
750 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
760 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
770 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
780 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
790 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
800 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
810 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
820 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
830 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
840 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
850 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
860 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
870 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
880 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
890 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
900 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
910 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
920 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
930 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
940 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
950 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
960 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
970 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)
980 x=(x+int)*x*(x+1)+y*(x+1)+x*(x+1)
990 y=(y+int)*y*(y+1)+x*(y+1)+y*(y+1)

```


BBC ACORN USER APRIL 1992 77


```

1670 0 NullChkCRS(0)
1680 TabChkCRS(0)
1690 Versions="1.00"
1695 0 NullChkCRS(0)
1700 0 NullChkCRS(0)
1710 0 NullChkCRS(0)
1720 0 NullChkCRS(0)
1730 0 NullChkCRS(0)
1740 0 NullChkCRS(0)
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1770 0 NullChkCRS(0)
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2010 0 NullChkCRS(0)
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2150 0 NullChkCRS(0)
2160 0 NullChkCRS(0)
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2190 0 NullChkCRS(0)
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2230 0 NullChkCRS(0)
2240 0 NullChkCRS(0)
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2300 0 NullChkCRS(0)
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2400 0 NullChkCRS(0)
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2590 0 NullChkCRS(0)
2600 0 NullChkCRS(0)
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2770 0 NullChkCRS(0)
2780 0 NullChkCRS(0)
2790 0 NullChkCRS(0)
2800 0 NullChkCRS(0)
2810 0 NullChkCRS(0)
2820 0 NullChkCRS(0)
2830 0 NullChkCRS(0)
2840 0 NullChkCRS(0)
2850 0 NullChkCRS(0)
2860 0 NullChkCRS(0)
2870 0 NullChkCRS(0)
2880 0 NullChkCRS(0)
2890 0 NullChkCRS(0)
2900 0 NullChkCRS(0)
2910 0 NullChkCRS(0)
2920 0 NullChkCRS(0)
2930 0 NullChkCRS(0)
2940 0 NullChkCRS(0)
2950 0 NullChkCRS(0)
2960 0 NullChkCRS(0)
2970 0 NullChkCRS(0)
2980 0 NullChkCRS(0)
2990 0 NullChkCRS(0)
3000 0 NullChkCRS(0)

```

```

2870 ORGGE R3,R3,LA
2880 MOV5 PA,R4,LA#R1
2890 ENR divloop
2900 J
2910 LDR A1,halfminute
2920 CMV R2,R1
2930 ADJAD R3,R3,R1
2940 MOV PA,R3
2950 J
2960 J#0
2970 J
2980 DEF PROCclore
2990 CDECL("Cclose")
3000 MODE 8
3010 REPORT
3020 PRINT " at line "RBL;
3030 PRINT " in optime"
3040 END
3050 ENDPROC

Listing 10

30 REM %Mortgage (Infofile)
31 REM %John West
32 REM %For all machines
40 REM (C) RAO April 92
50 J
60 MODE 7
70 PROCinit
80 DEFINT
90 PROCdisplay
100 PROCinput
110 PROCcalc
120 PROCresult
130 PROCrepeat
140 UNTIL FALSE
150 J
160 DEF PROCinit
170 @cls=CHR$(141)+$S="MORTGAGE";@ls=CHR
1116
180 DEF=CHR$(129)+$rs=CHR$(130)
190 DEF=CHR$(131)+$rs=CHR$(135)
200 VY=(1-@ls)*@rs/2
210 ENDPROC
220 J
230 DEF PROCdisplay
240 CLS
250 FOR I=2 TO 3:PRINTTAB(8,I);@yes@dl
260 DEF PRINT "Calculates mortgagy mortgage
270 payments""For various rates and peri
280 od:"
290 PRINTTAB(0,6) "For a given rate of
300 res="Y$%/year repaid"
310 PRINTTAB(0,7) "over res="T$%$years
320 "at rate res="R$%$
330 PRINTTAB(0,8) "for res="I$%$, res=
340 "I=5.5% and res="I=1.8% and res="I=1.5%
350 "
360 PRINT TAB(0,9) "over res="Y$%$,"re
370 $=T$%$ and res="R$%$ and res="Y$%$ years."
380 ENDPROC
390 J
400 DEF PROCprocuit
410 INPUT "Enter amount of loan ($): "
420 "p$
430 INPUT "Enter lowest rate (% p.a.): "
440 "p$
450 INPUT "Enter shortest time (years)
460 "T$
470 ENDPROC
480 J
490 J
500 DEF PROCcalc
480 DIM M$(3,2),T$(3,2)
490 FOR I=0 TO 2
500 FOR J=0 TO 2
510 M$(I,J)=(1/2)/100
520 A$(I,J)=
530 M$(I,J)*T$(I,J)*Y$+5%
540 M$(I,J)=(12/I-1)
550 T$(I,J)=(12/I-1)*Y$+5%
560 MS$(I,J)=P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
570 T$(I,J)=P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
580 NEXT
590 NEXT
540 ENDPROC
530 J
540 DEF PROCresult
550 CLS
560 PRINTTAB(0,6)@yes$ "Mortgage Int. Re
570 pay Monthly Total"
580 PRINTTAB(0,6)@yes$ "loan rate ti
590 me payment paid"
600 PRINTTAB(1,2)@f "y$ years
610 "
620 FOR I=0 TO 3
630 FOR J=0 TO 3
640 Y$=(1/2)+4*(I+1)
650 R$=(1/2)+$rs*(I+1)
660 T$=(1/2)+$rs*(I+1)
670 L$=LEN$(T$)+5%+1
680 M$=LEN$(M$)+5%+1
690 P$=LEN$(P$)+5%+1
700 PRINTTAB(10-K$,Y$)M$(I,J)+5%+1
710 L$=LEN$(L$)+5%+1
720 M$=LEN$(M$)+5%+1
730 NEXT
740 NEXT
750 PRINTTAB(10-K$,Y$)T$(I,J)+5%+1
760 ENDPROC
770 DEF P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
780 DEF P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
790 IF dot=LA-2 THEN x$="
800 IF dot=LA-1 THEN x$="* "
810 IF dot=LA THEN x$="**"
820 REPEAT
830 L$=LEN$(
840 X$=STR$(X$+LEN$(L$)-1)
850 UNTIL INSTR(X$,"*")=L$-3
860 x$=
870 J
880 DEF P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
890 J
900 DEF P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
910 DEF P$*P$*P$*P$*P$*P$*P$*P$*P$*P$
920 DEF PROCrepeat
930 PRINTTAB(5,2);ref@ls="Press SPACE

```

10 REM >M0

```

20 REM Thinking by Malcolm Gray
30 REM Visual display by J A McHugh
40 REM for all machines
50 REM [c] BAD AP 92
60
70 MODE 7
80 PROC(0)
90 PROCLIST
100 gosub
110 NEXTAT
120 PROCgreen
130 guess#
140 IF gosub PROCscore ELSE PROCman
150 IF black#4 THEN score#(go)=score#(go)+1
160 IF gosub AND black#4 PROCinfo"Mel
170 I done - you got it"
180 IF gosub AND black#4 PROCinfo"Sorry - it was .+sol$
190 IF gosub AND black#4 PROCinfo"1' g
200
210 IF gosub AND black#4 PROCinfo"oop
220 s, I didn't get it"
230 goto NEXTKEY(1500)
240 gosub
250 IF gosub PROCinfo{"SCORES: you="+STR
260 score+"; guess="+STR(guess)+"; hi=
270 hi+STR(hi)+", me="+STR(score+1)+";
280 hi=STR(hi)+", me="+STR(score+1)+";
290 hi=STR(hi)+", me="+STR(score+1)+";
300 ENDPROC
310
320 DEF PROCman
330 PROC i=0 TO 3
340 col#(i)=RND(7)-1
350 NEXT
360 PROCman(guess,"Your guess")
370 PROCmark(guess)
380 PROCguess#
390 PROCguess#
400 IF gosub OR gosub AND black#4
410 ENDPROC
420
430
440 DEF PROCcomp
450 PROCenter(0,"Enter code")
460 PROC i=0 TO 3
470 col#(i)=col#(i)+1
480 NEXT
490 PROCmakestrings
500 col#(5,20,CHR$135)="Thinking
510 "+sol$+";"
520 history#
530 PROC
540 PROCguess#
550 IF black#4 PROCp1
560 ENDPROC
570
580 DEF PROCint
590 DIM col#(3),in#(4),mark#(3,2),score#(1)
600
610 DIM q#(209,5)
620 DIM b#(15,4)
630 DIM bch#(15,3)
640 DIM an#(4)
650 col#="PROGRAM"
660 sol#=""
670 sol#="sol#"+CHR$(128+i)*MID$(col#5,i)
680 NEXT
690 ENDPROC
700
710 DEF PROCmakestrings
720 sol#=""
730 PROC i=0 TO 3
740 sol#="sol#"+CHR$(145+col#(i))*CHR$(175+col#(i))
750 NEXT
760 sol#="sol#"+CHR$(156+CHR$(135)
770 ENDPROC
780
790 DEF PROC(0)
800 VDU 3,128,255-159*#;0;0;0;0;0
810 ENDPROC
820
830 DEF PROCscore
840 VDU 12,132,157,12,156,31,37,1
850 PROC i=0 TO 32
860 VDU 31,0,1,132,157,12,156,31,37,1
870 NEXT
880 VDU 31,3,18,132,157,31,0,2,132,15
890
900 FOR i=0 TO 3:PRINT"INPUT"SPC13;"REP
910
920 PROC i=0 TO 17:VDU 31,31,1,141,NE
930 PROC i=0 TO 17:VDU 31,31,1,132,15
940 NEXT
950
960 PROC i=0 TO 21:VDU 31,31,1,141,NE
970 ENDPROC
980 PRINTTAB(x,y);str$;TAB(x,y-1);str$
990
1000 ENDPROC
1010
1020 DEF PROCman(guess,g)
1030 PROC(5,20,CHR$(135)+g$+" =mel
1040
1050 *FX 21.1
1060 deg=0
1070 deg=FALSE
1080 NEXT
1090
1100 PROC(1)
1110 VDU 31,peg*3,6,2,guess*2
1120 key#
1130 PROC(0)
1140
1150 IF key=127 AND peg#0 peg#peg#1

```



```

1100 IF key=13 AND peg4 done=TRUE
1110 col=INSTR(col$5,CHR$(key AND &DFF))
1120 IF col=0 AND peg4 PROCpeg(peg3+
2,guess,col):in!(peg):col:peg:peg1
1130 UNTIL done
1140 ENDFROC
1150 :
1160 DEF PROCahowguess(guess)
1170 FOR peg4 TO 3
1180 PROCpeg(peg3+2,guess,in!(peg))
1190 NEXT
1200 ENDFROC
1210 :
1220 DEF PROCmake(guess)
1230 FOR i=0 TO 3
1240 mark$(i,1)=0
1250 mark$(i,2)=0
1260 NEXT
1270 mark$=20
1280 white$=0
1290 black$=0
1300 FOR i=0 TO 3
1310 IF in$(i):col$(i) PROCdo(i,1,3)
1320 NEXT
1330 FOR i=0 TO 3
1340 FOR j=0 TO 3
1350 IF i<=j AND in$(i):col$(j) PROCdo(
1,i,j)
1360 NEXT
1370 NEXT
1380 ENDFROC
1390 :
1400 DEF PROCdo(peg1,peg2,c)
1410 IF mark$(peg1,1)=1 OR mark$(peg2,2
)=1 ENDFROC
1420 mark$(peg1,1)=1
1430 mark$(peg2,2)=1
1440 PROCpeg(mark$,guess,c)
1450 IF c=3 black$=black$+ELSE white$
=white$+1
1460 mark$=mark$+3
1470 ENDFROC
1480 :
1490 DEF PROCmake(x,y,c)
1500 VDU 31,x,3,y:2+1
1510 IF c=1 VDU 32,32,8,8,10,32,3
2,32 ELSE VDU 33,c,124,124,8,8,8,10,145
+c,124,124
1520 ENDFROC
1530 :
1540 DEF PROCpt1
1550 k=0
1560 FOR x=0 TO 4
1570 FOR y=0 TO 4-a
1580 FOR z=0 TO 4-b-a
1590 FOR d=0 TO 4-c-b-a-z
1600 FOR e=0 TO 4-d-c-b-a-z
1610 FOR f=0 TO 4-e-d-c-b-a-z
1620 g=4-e-b-d-c-b-a-z
1630 ch$(k,0)=a
1640 ch$(k,1)=b
1650 ch$(k,2)=c
1660 ch$(k,3)=d
1670 ch$(k,4)=e
1680 ch$(k,5)=f
1690 ch$(k,6)=g
1700 k=k+1
1710 NEXT
1720 NEXT
1730 NEXT
1740 NEXT
1750 NEXT
1760 FOR x=0 TO 6
1770 g$(x)=in$(x)
1780 NEXT
1790 NEXT
1800 mark$=k+1
1810 REPEAT
1820 t=PRG0
1830 ch$=0
1840 FOR y=0 TO max$
1850 IF PRG0(y)<0 THEN PROCpy(y,0)
1860 NEXT
1870 mark$=ch$-1
1880 b=100
1890 FOR y=0 TO 6
1900 g$(y)=ch$(y)
1910 NEXT
1920 UNTIL ch$=1 OR guess$=0
1930 ENDFROC
1940 :
1950 DEF PRG0
1960 LOCAL x
1970 PROCxv
1980 PROCxv
1990 b=b+1
2000 FOR x=0 TO 3
2010 b$(x)=history$(x)=in$(x)

```

```

2020 NEXT
2030 history$(x)=history$(x)+1
2040 white$=black$
2050
2060 DEF PROCpy(y,x)
2070 LOCAL g$
2080 FOR g=0 TO 6
2090 ch$(g,0)=g
2100 ch$(g,1)=g
2110 NEXT
2120 ENDFROC
2130 :
2140 DEF PRG0(x)
2150 LOCAL t$
2160 ch$(t)=PRG1(g$(y),ch$(x,y))
2170 NEXT
2180 t=t+1
2190 :
2200 DEF PRG1(a,b)
2210 IF a$(a) THEN b=a
2220 a$
2230 :
2240 DEF PROC2
2250 PROCmakeperm
2260 PROCcopydown
2270 FOR x=0 TO 3
2280 g$(x)=ch$(0,x)
2290 NEXT
2300 REPEAT
2310 t=PRG1
2320 ch$=0
2330 FOR y=0 TO max$
2340 IF t=PRG0(y) THEN PROCpy(y,0)
2350 NEXT
2360 mark$=1
2370 FOR y=0 TO 3
2380 g$(y)=in$(y)
2390 NEXT
2400 UNTIL ch$=1 OR guess$=0
2410 IF black$=4 THEN t=PRG1
2420 ENDFROC
2430 :
2440 DEF PROCcopydown
2450 ch$=0
2460 FOR y=0 TO max$
2470 IF PRG1(y)=FALSE AND PRG2(y)=1
2480 LOCAL t$
2490 ch$(t)=ch$(y)
2500 NEXT
2510 :
2520 DEF PROCmakeperm
2530 a$(0)=PRG1
2540 mark$=1
2550 FOR y=0 TO max$
2560 REPEAT
2570 d=ch$-1
2580 ch$(0)=d
2590 b$(0)=ch$(0)+1
2600 a$(0)=b$(0)+1
2610 UNTIL (a$(0)+b$(0)+c$(0)+d$(0))=
4
2620 ch$(0)=a$(0)+b$(0)+c$(0)+d$(0)
2630 ch$(1)=a$(0)+b$(0)+c$(0)+d$(0)
2640 ch$(2)=a$(0)+b$(0)+c$(0)+d$(0)
2650 ch$(3)=a$(0)+b$(0)+c$(0)+d$(0)
2660 NEXT
2670 ENDFROC
2680 :
2690 DEF PRG2(x)
2700 IF y$(x)<0 THEN t=0
2710 LOCAL x$
2720 FOR x=0 TO 1 TO max$
2730 t=t+1 OR PRG2(x)
2740 NEXT
2750 t=0
2760 :
2770 DEF PRG2(x)
2780 IF ch$(x,0)+ch$(x,1)+ch$(x,2)+ch$(x,3)+ch$(x,4)+ch$(x,5)+ch$(x,6) THEN t=0
2790 IF ch$(x,0)+ch$(x,1)+ch$(x,2)+ch$(x,3)+ch$(x,4)+ch$(x,5)+ch$(x,6) THEN t=0
2800 IF ch$(x,0)+ch$(x,1)+ch$(x,2)+ch$(x,3)+ch$(x,4)+ch$(x,5)+ch$(x,6) THEN t=0
2810 IF ch$(x,0)+ch$(x,1)+ch$(x,2)+ch$(x,3)+ch$(x,4)+ch$(x,5)+ch$(x,6) THEN t=0
2820 t=1
2830 :
2840 DEF PROCxv(x,y)
2850 LOCAL t$
2860 FOR x=0 TO 3
2870 ch$(x,0)=ch$(x,1)
2880 NEXT
2890 ENDFROC
2900 :
2910 DEF PRG0(x,y)
2920 LOCAL x$
2930 FOR x=0 TO 3
2940 ch$(x,0)=ch$(x,1)
2950 NEXT
2960 t$

```

Listing 12

```

10 REM >Scribe (info12)
20 REM BY Sam Wackins
30 REM FOR RISC OS machines
40 REM (C) 2001 Apr 92
50 :
60 REM ERROR MODE 0:IF ERR<17 PRINTHE
PORT$ at line :ERR=END ELSE END
70 DIM x1(2),y1(2),x2(2),y2(2),E(2)
80 REPEAT
90 PROCIPT
100 PROCcircel
110 PROCcircel2
120 PROCdraw
130 PROCdraw
140 UNTIL FALSE
150 END
160 :
170 DEF PROCIPT
180 MOVE 15:MOVE 12:OFF
190 COLOUR 1,7
200 COLOUR 2,3
210 COLOUR 4,4
220 COLOUR 5,6
230 COLOUR 6,4
240 COLOUR 6,1
250 COLOUR 12,1
260 COLOUR 10,1
270 bank=1
280 *POINTER
290 ORIGIN 640,512
300 OCUL 4,0
310 SYS 6,113,bank
320 SYS 6,112,3-bank
330 ENDFROC
340 :
350 DEF PROCcircel
360 OCUL 3,1
370 or=1000
380 REPEAT
390 MOVE x,y:b
400 ri=SQRT(2)*y/2
410 CIRCLE 0,ri
420 PROCdraw
430 CIRCLE 0,0,or
440 or=1
450 UNTIL b

```

FACE BENDER

Listing 1

```

10 REM MakeData32 (Face1)
20 REM for Arc only
30 REM (c) 2001 Apr 92
40 :
50 file$=PRGOUT "FaceData"
60 REPEAT
70 UNTIL output$="ENDOFDATA" THEN BPUT
file$,output$
80 UNTIL output$="ENDOFDATA"
90 CLOSE file$
100 $setType "FaceData.txt"
110 PRINT "FaceData created."
120 END
130 :
140 DATA " " = "FaceData"
150 DATA
160 DATA "rmax":640,512,536,500,760,50
0
170 DATA "rmin":640,512,536,500,760,50
0
180 DATA "rmax":640,512,536,500,760,50
0
190 DATA "rmin":640,512,536,500,760,50
0
200 DATA "Segment: Left eye"
210 DATA "Line: 532,500 536,504 540,50
0"
220 DATA "Line: 532,500"

```

```

230 DATA "Line: 704,512 764,532 816,50
0"
240 DATA "Line: 712,476 748,464 784,46
0"
250 DATA "Line: 484,492 532,480 580,48
0"
260 DATA "Line: 472,508 528,532 592,51
2"
270 DATA "Line: 508,464 540,468 576,46
8"
280 DATA
290 DATA "Segment: Left eyebrow"
300 DATA "Line: 448,532 452,552 500,57
2"
310 DATA "Line: 448,532 452,552 500,57
2"
320 DATA "Line: 448,532 452,552 500,57
2"
330 DATA "Segment: Right eye"
340 DATA "Line: 756,500 760,504 764,50
0"
350 DATA "Line: 756,500 760,504 764,50
0"
360 DATA "Line: 760,512 764,504 768,51
2"
370 DATA "Line: 708,492 760,512 812,49
2"
380 DATA "Line: 708,492 764,480 804,48
0"
390 DATA
400 DATA "Segment: Right eyebrow"
410 DATA "Line: 812,476 816,464 864,46
0"
420 DATA "Line: 812,476 816,464 864,46
0"
430 DATA "Line: 812,476 816,464 864,46
0"
440 DATA "Line: 812,476 816,464 864,46
0"
450 DATA "Line: 812,476 816,464 864,46
0"
460 DATA "Line: 812,476 816,464 864,46
0"
470 DATA "Line: 812,476 816,464 864,46
0"
480 DATA "Line: 812,476 816,464 864,46
0"
490 DATA "Line: 812,476 816,464 864,46
0"
500 DATA "Line: 812,476 816,464 864,46
0"
510 DATA
520 DATA "Segment: Right cheekbone"
530 DATA "Line: 768,536 768,532 540,32
0"
540 DATA "Line: 768,536 768,532 540,32
0"
550 DATA "Line: 768,536 768,532 540,32
0"
560 DATA "Line: 768,536 768,532 540,32
0"
570 DATA "Line: 768,536 768,532 540,32
0"
580 DATA "Line: 768,536 768,532 540,32
0"
590 DATA "Line: 768,536 768,532 540,32
0"
600 DATA "Line: 768,536 768,532 540,32
0"
610 DATA "Line: 768,536 768,532 540,32
0"
620 DATA "Line: 768,536 768,532 540,32
0"
630 DATA "Line: 768,536 768,532 540,32
0"
640 DATA "Line: 768,536 768,532 540,32
0"
650 DATA "Line: 768,536 768,532 540,32
0"
660 DATA "Line: 768,536 768,532 540,32
0"
670 DATA "Line: 768,536 768,532 540,32
0"
680 DATA "Line: 768,536 768,532 540,32
0"
690 DATA "Line: 768,536 768,532 540,32
0"
700 DATA "Line: 768,536 768,532 540,32
0"
710 DATA "Line: 768,536 768,532 540,32
0"
720 DATA "Line: 768,536 768,532 540,32
0"
730 DATA "Line: 768,536 768,532 540,32
0"
740 DATA "Line: 768,536 768,532 540,32
0"
750 DATA "Line: 768,536 768,532 540,32
0"
760 DATA "Line: 768,536 768,532 540,32
0"
770 DATA "Line: 768,536 768,532 540,32
0"
780 DATA "Line: 768,536 768,532 540,32
0"
790 DATA "Line: 768,536 768,532 540,32
0"
800 DATA "Line: 768,536 768,532 540,32
0"
810 DATA "Line: 768,536 768,532 540,32
0"
820 DATA "Line: 768,536 768,532 540,32
0"
830 DATA "Line: 768,536 768,532 540,32
0"
840 DATA "Line: 768,536 768,532 540,32
0"
850 DATA "Line: 768,536 768,532 540,32
0"
860 DATA "Line: 768,536 768,532 540,32
0"
870 DATA "Line: 768,536 768,532 540,32
0"
880 DATA "Line: 768,536 768,532 540,32
0"
890 DATA "Line: 768,536 768,532 540,32
0"
900 DATA "Line: 768,536 768,532 540,32
0"
910 DATA "Line: 768,536 768,532 540,32
0"
920 DATA "Line: 768,536 768,532 540,32
0"
930 DATA "Line: 768,536 768,532 540,32
0"
940 DATA "Line: 768,536 768,532 540,32
0"
950 DATA "Line: 768,536 768,532 540,32
0"
960 DATA "Line: 768,536 768,532 540,32
0"
970 DATA "Line: 768,536 768,532 540,32
0"
980 DATA "Line: 768,536 768,532 540,32
0"
990 DATA "Line: 768,536 768,532 540,32
0"

```




```
720 DATA
730 DATA "Segment: Side of head + outer
cheekbones"
740 DATA "Line: 412,516 404,444 416,35
"
750 DATA "Line: 876,528 888,444 872,36
"
760 DATA "Line: 420,368 436,344 448,32
"
770 DATA "Line: 872,368 856,348 864,32
"
780 DATA
790 DATA "Segment: Chin"
800 DATA "Line: 416,356 432,284 460,22
4 516,158 588,120 648,108 720,124 784,16
8 624,220 680,284 876,368"
810 DATA
820 DATA "Segment: Hairline"
830 DATA "Line: 404,584 428,564 456,62
4 456,644 524,700 584,712 640,708 896,70
8 752,696 804,660 840,624 868,576 888,50
8"
840 DATA
850 DATA "Segment: Hair"
860 DATA "Line: 372,284 312,308 304,51
2 376,516 380,580 516,896 632,904 752,90
8 868,924 944,704 984,544 988,408 932,28
8"
870 DATA
880 DATA "Segment: Chin clefts"
890 DATA "Line: 648,152 648,128"
900 DATA
910 DATA "Segment: Chin line"
920 DATA "Line: 612,360 648,208 692,19
6"
930 DATA "ENDOFDATA"
```

Listing 2

```
10 REM %FaceHeader (Face2)
20 REM By Yan Vibe
30 REM FOR BASIC OS machines
40 REM (C) BAW Apr 92
50 :
60 ON ERROR CLOSE #0:PRINTREPORTS%: a
t line %ERR:END
70 MODR 136:MODR 8:OFF
80 COLOR 0,0,64,128
90 COLOR 1,160,160,160
100 COLOR 2,0,0,0
110 YD 15,8,74,8,64,128
120 steps=10
130 PROCloaddata
140 face(1)=face(1)+steps(1)
150 b=2
160 REPEAT
170 PROCdraw(1)=face(1)
180 steps(1)=face(2)-face(1)
190 steps(2)=steps(1)+steps(1)
200 FOR frame=1 TO steps
210 face(1)=face(1)+steps(1)
220 WAIT
230 SP 6,112,b:SP 6,113,b:CLS
240 b=b+1
250 GOAL 1
260 CIRCLE FILL 640,512,500
270 GOAL 2
280 FOR i=1 TO points
290 PLOT opt(i),face(1,0),face(1,1)
300 NEXT
310 NEXT
320 UNTIL Pts=4
330 END
340 :
350 DEF %FXline
360 REPEAT
370 lines=GET$IN
380 UNTIL lines<="" AND LEFT$(lines,1)
<=""
390 :
400 :
410 DEF %Fcountspaces(heads)
420 PTR=Line#
430 count=0
440 REPEAT
450 a=GET$IN
460 IF LEFT$(a,LEN(heads))=heads% THEN
470 FOR i=1 TO LEN(a)
480 IF MID$(a,i,1)= " " count=i
490 NEXT
500 ENDIF
510 UNTIL EOF#IN
520 :count
530 :
540 DEF %PROCxy(x:RETURN x,RETURN y)
550 x=VAL$IN#0
560 y=VAL$IN#1:lines=INSTR$(lines,")")-1
570 PROCgetospace(lines)
580 ENDOFC
590 :
600 DEF %PROCdraw(R:RETURN a$)
610 a$=MID$(a$,INSTR(a$,")"),1)
620 ENDOFC
630 :
640 DEF %Pline(a$,b$)
650 a$=LEFT$(a$,LEN(b$))+b$
660 :
670 DEF %PROCloaddata
680 in=OPEN$(%FaceData")
690 in=GET$IN:countspaces("Face")
700 points=%Fcountspaces("Face")
710 DIM ref(refs),ref(refs),dref(dre
fs),dref(dref)
720 DIM face(points,1),face(points,2)
730 DIM seg(point),opt(point),steps(
1)
740 PTR=Line#
750 DEF %FXline
760 IF NOT Pline(lines,"ref") ERRORR
1,"Missing reference points"
770 PROCgetospace(lines)
780 FOR i=1 TO LEN(a)
790 PROCgetoxy(ref(i),ref(i))
800 NEXT
810 seg=0
820 point=0
830 opt=i+5
840 GOAL 1:CIRCLE FILL 640,512,500:GO
1,2
```

```
850 WHILE NOT EOF#IN
860 line=%FXline: "
870 IF LEFT$(line,7)=%Segment THEN
880 IF LEFT$(line,4)=%Line THEN
890 PROCgetospace(lines)
900 opt=(point+1)+4
910 REPEAT
920 point=+1
930 PROCxy(face(point,0),face(point,
1))
940 PLOT opt(point),face(point,0),face
(point,1)
950 seg(point)=+seg
960 UNTIL line=""
970 ENDIF
980 ENDWHILE
990 CLOSE #in
1000 ENDOFC
1010 DEF %PROCdraw(R:RETURN dref(i))
1020 facewidth=%Fnd(0.5,1.0)
1030 faceheight=%Fnd(0.5,1.0)
1040 round=%Fnd(0.5,1.5)
1050 eyeid=%Fnd(10,30)
1060 eyeheight=%Fnd(0.4,1.2)
1070 eyeheight=%Fnd(0.6,1.2)
1080 nosewidth=%Fnd(0.5,1.7)
1090 noseheight=%Fnd(0.4,1.0)
1100 mouthwidth=%Fnd(0.5,1.5)
1110 mouthheight=%Fnd(0.5,1.4)
1120 earwidth=%Fnd(0.1,1.5)
1130 earheight=%Fnd(0.3,1.0)
1140 browheight=%Fnd(0.6,1.25)
1150 chinheight=%Fnd(1.0,1.25)
1160 browid=%Fnd(0,60)
1170 c1=(round-1)/1024 :c1=c1+1:facew
idth
1180 c1=1.5-round :c1=c1+2:facew
idth
1190 dref(1)=refx(i)
1200 dref(2)=refy(i)
1210 dref(3)=refy(i)
1220 FOR i=1 TO 10
1230 x=%Fnd(1-dref(i),1),c1*dref(i)+c2
1240 dref(1)=%Fnd(x,1,facewidth)
1250 dref(2)=%Fnd(dref(i),1,facewid
th)
1260 NEXT
1270 dref(3)=%Fnd(1,1,facewidth)
1280 dref(3)=%Fnd(1,1,facewidth)
1290 FOR point=1 TO points
1300 x=face(point,0)
1310 y=face(point,1)
1320 x=%Fnd(x,1,c1*y+c2)
1330 y=%Fnd(y,1,faceheight)
1340 y=%Fnd(y,1,faceheight)
1350 CASE seg(point OF
1360 WHEN 1,2
1370 x=%Fnd(x,eyeid,3,eyeheight)
1380 IF seg(point)=2 y=browid
1400 WHEN 3,4
1410 x=%Fnd(x,eyeid,3,eyeheight)
1420 y=%Fnd(y,3,eyeheight)
1430 IF seg(point)=4 y=browid
1440 WHEN 5,6,7
1450 x=%Fnd(x,4,nosewidth)
1460 y=%Fnd(y,4,noseheight)
1470 WHEN 8,9,10
1480 x=%Fnd(x,5,mouthwidth)
1490 y=%Fnd(y,5,mouthheight)
1500 WHEN 11
1510 x=%Fnd(x,6,earwidth)
1520 y=%Fnd(y,6,earheight)
1530 WHEN 12
1540 x=%Fnd(x,7,earwidth)
1550 y=%Fnd(y,7,earheight)
1560 WHEN 13,16
1570 REM Soching
1580 WHEN 15
1590 y=%Fnd(y,8,browheight)
1600 WHEN 14,17,18
1610 y=%Fnd(y,9,chinheight)
1620 ENDOFC
1630 distort(point,0)=x
1640 distort(point,1)=y
1650 REPEAT
1660 DEF %Fnd(x:var,ref,scal)
1670 =(-var-dref(x:ref))*scale+dref(ref)
1680 :
1690 DEF %Fnd(x:ref,scal)
1700 =(-var-dref(x:ref))*scale+dref(ref)
1710 DEF %Fnd(x:ref,scal)
1720 =(-var-dref(x:ref))*scale+dref(ref)
1730 :
1740 DEF %Fnd(min,max)
1750 =max-min:RAND(1)*min
```

Listing 3

```
10 REM %Create Face (Face3)
20 REM For Eight-bit machines
30 REM (C) BAW Apr 92
40 :
50 file=%Fnd("FACE3")
60 READ data$
70 IF data$<="" THEN SPUT$fill,0V
80 :
90 UNTIL data$<=""
100 CLOSE #file
110 PRINT "Face3 created"
120 END
130 :
140 DATA 81,87,97,83,83,87,48
150 DATA 81,83,83,00,00,00,00
160 DATA 00,00,00,00,00,00,00
170 DATA 00,00,00,00,00,00,00
180 DATA 00,00,00,00,00,00,00
190 DATA 00,00,00,00,00,00,00
200 DATA 00,00,00,00,00,00,00
210 DATA 00,00,00,00,00,00,00
220 DATA 00,00,00,00,00,00,00
230 DATA 00,77,81,77,74,81,88
240 DATA 98,81,85,78,00,00,00
250 DATA 00,00,00,00,00,00,00
260 DATA 00,00,00,00,00,00,00
270 DATA 00,00,00,00,00,00,00
280 DATA 00,00,00,00,00,00,00
290 DATA 00,00,00,00,00,00,00
300 DATA 00,00,00,00,00,00,00
```

```
310 DATA 00,00,00,00,00,00,00
320 DATA 00,00,00,00,00,00,00
330 DATA 00,00,00,00,00,00,00
340 DATA 00,00,00,00,00,00,00
350 DATA 00,00,00,00,00,00,00
360 DATA 00,00,00,00,00,00,00
370 DATA 00,00,00,00,00,00,00
380 DATA 00,00,00,00,00,00,00
390 DATA 00,00,00,00,00,00,00
400 DATA 00,00,00,00,00,00,00
410 DATA 00,00,00,00,00,00,00
420 DATA 00,00,00,00,00,00,00
430 DATA 00,00,00,00,00,00,00
440 DATA 00,00,00,00,00,00,00
450 DATA 00,00,00,00,00,00,00
460 DATA 00,00,00,00,00,00,00
470 DATA 00,00,00,00,00,00,00
480 DATA 00,00,00,00,00,00,00
490 DATA 00,00,00,00,00,00,00
500 DATA 00,00,00,00,00,00,00
510 DATA 81,81,81,81,81,81,81
520 DATA 81,81,81,81,81,81,81
530 DATA 81,81,81,81,81,81,81
540 DATA 82,82,82,82,82,82,82
550 DATA 82,83,83,83,83,83,83
560 DATA 83,83,83,83,83,83,83
570 DATA 83,83,83,83,83,83,83
580 DATA 83,84,84,84,84,84,84
590 DATA 84,84,84,84,84,84,84
600 DATA 85,85,85,85,85,85,85
610 DATA 85,85,85,85,85,85,85
620 DATA 85,85,85,85,85,85,85
630 DATA 85,86,86,86,86,86,86
640 DATA 86,86,86,86,86,86,86
650 DATA 86,86,86,86,86,86,86
660 DATA 86,86,86,86,86,86,86
670 DATA 86,86,86,86,86,86,86
680 DATA 86,86,86,86,86,86,86
690 DATA 86,86,86,86,86,86,86
700 DATA 86,86,86,86,86,86,86
710 DATA 86,86,86,86,86,86,86
720 DATA 86,86,86,86,86,86,86
730 DATA 86,86,86,86,86,86,86
740 DATA 86,86,86,86,86,86,86
750 DATA 86,86,86,86,86,86,86
760 DATA 86,86,86,86,86,86,86
770 DATA 86,86,86,86,86,86,86
780 DATA 86,86,86,86,86,86,86
790 DATA 86,86,86,86,86,86,86
800 DATA 86,86,86,86,86,86,86
810 DATA 86,86,86,86,86,86,86
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880 DATA 86,86,86,86,86,86,86
890 DATA 86,86,86,86,86,86,86
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940 DATA 86,86,86,86,86,86,86
950 DATA 86,86,86,86,86,86,86
960 DATA 86,86,86,86,86,86,86
970 DATA 86,86,86,86,86,86,86
980 DATA 86,86,86,86,86,86,86
990 DATA 86,86,86,86,86,86,86
```

```
10 REM %Source4 - for fast 6502 lined
raw (Face4)
20 REM Draw Lawrence
30 REM FOR 8 bit machines
40 REM (C) BAW Apr 92
50 :
60 c1=70
70 y1=471
80 x2=472
90 y2=473
100 draw4
110 dy=875
120 flags=876
130 c1=77
140 c2=79
150 err=478
160 addr=479
170 point=477
180 screen=480
190 FOR pass=0 TO 2 STEP 2:PTR=4780
200 (OPP pass
210 JWP c1a
220 draw
230 STX x+2
240 STY y+2
250 STX opt+2
260 LDA 0a
270 STX point
280 drawloop
290 LDA x2
300 STX x1
310 STY y2
320 STX y1
330 LOY point
340 x=
350 LDA #PTR,y
360 STX x1
370 STY y1
380 STX y1
390 STX y1
400 LDA #PTR,y
410 STX y1
420 STX y1
430 STX y1
440 STX y1
450 STX y1
460 STX y1
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990 STX y1
```

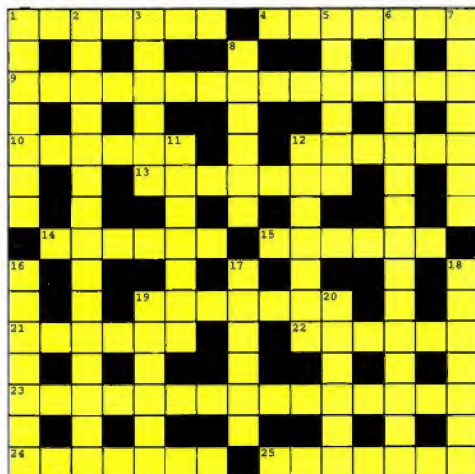
Listing 4

BBC ACORN USER APRIL 1992 81

[illegible]

ARM PROGRAMMING

BBC Acorn User cryptic crossword, April 92



Across

- 1 Following revolution, Tsarina becomes a mechanic! (7)
- 4 Policeman needs dark Chinese force to reveal a forger's skill (7)
- 9 "Might Sir fall out?" "From this, Sir surely won't!" (6,9)
- 10 Many singers are so rich, but twisted... (6)
- 12 ...they're all made greedy to some extent! (6)
- 13 Made cryptic notes about officer (7)
- 14 I am left on the quay? (6)
- 15 One who might streak about on the ice (6)
- 19 A sore back? There's nothing left but this spray! (7)
- 21 What early Sixteenth century records often looked like (6)
- 22 Peter has white material (6)
- 23 The BBC, for example, manufacture internally, bottom brackets for the bulk of electronic components (15)
- 24 The French model is indeed discontinued (7)
- 25 Spinster has purpose in exploits... (7)

Down

- 1 ... that concerns church uprising amidst staff reform (7)
- 2 Motoring article about something to do with ratios? (15)
- 3 When stung by the wasp, he reacted by hiding the ball! (6)
- 5 Carefully hidden, I follow student into flat (6)
- 6 Readings from tarot inspire ten to reform (15)
- 7 Heavy metal supporters (7)
- 8 What you might look through to find your files (6)
- 11 Wind instrument made from tin, gold and a chunk of nickel (7)
- 12 A place for the environmentally friendly? (7)
- 16 Taken for granted that Sue's mad and deranged? (7)
- 17 Universal magazines? (6)
- 18 One play in five starts spreading infections (7)
- 19 Nearly the majority of all... and all of the majority! (6)
- 20 These could lessen distortion (6)

Chambers 20th century dictionary is recommended. Send your completed entries to *BBC Acorn User*, 20-26 Brunswick Place, London N1 6DJ to reach us by Friday February 10 1992. Photocopies of your solution are acceptable.

The solution (and winner) will be published in the June issue. Meanwhile the winner of February's crossword (answer shown right) is Paul Chaplin of King's Lynn.

Last month's solution



Circular arguments?

It will soon be summer again and once more fields all over the West Country will be full of crops, meteorologists, psychics and sceptics. Will Doug Bower and Dave Chorley be 'at it' again with pole, plank and string? Will the Plasma Vortex rear its ugly head or will Jimmy Page merely be out with his Box Brownie in search of album covers. Who knows?

But until the first circular speciality this year, perhaps you'd like to have a go at what Doug and Dave did with our specially written one-liner. Type in the listing as it is and squash it with the key definition below - the program won't run properly on multiple lines. The program will run on all Acorn machines and will present you with a beautiful field of golden corn swaying gently in the summer breeze. Doug and Dave are represented by small dots and start off in the bottom left hand corner. G, H, J and I will move them, and, naturally D swaps between who you are guiding. Pressing L will flatten the corn in a straight line between the two hoaxers and the O will make a mystical circle with the selected man at the edge and the other at its epicentre. Rings can be formed by creating a second circle within the first - the praxters will magically stand all the corn upright again.

Complex patterns can, of course, be formed by combining these basic shapes. If anyone creates any particular masterpieces, we at the puzzle page would be delighted to see your efforts...

```
10 MODEL
20 VDU19:3;0;19,3,2;0;
30 DIMx(1),y(1)
40 REPEAT
50 GCOL3,1
60 REPEAT
70 k=INKEY0-68
80 n=-(k-0)EORN
90 x=x(n)
100 y=y(n)
110 x=x(1-n)
120 y=y(1-n)
130 PLOT69,x,y
140 PLOT69,x,y
150 x(n)=x+4*((k=3)-(k=4))
160 y(n)=y+4*((k=6)-(k=5))
170 r=SQR((x-x)^2+(y-y)^2)
180 PLOT69,x,y
190 PLOT69,x,y
200 UNTILK>7
210 GCOLD,3-POINT(x,y)
220 IFK=BDRAWX,Y
230 UNTILOELSEFORa=0TO360
240 MOVEX,y
250 PLOT81,r*SINRADA,r*C
260 NEXT
270 UNTILO
```

```
*KEY0 f=PA.+4:t=f:b=aF5:REP.c=(b<aF5):?t=-?t*NOTc-58*
c:t=t-c:x=f?-1:FOR i=1TOX-4:b=?f?:b=f+1:t=t+1:N.:f
=f+4:U.f?-3=aFF:?t=aD:t?1=aFF:?(PA.+3)=t-PA.|M
Function key definition to squash listings on to one line.
```

'O' Dear!

John Fletcher of Prestwich, Manchester has a challenge for you. Here are 12 words with their 'O's removed. Can you figure out what the words should be? While you do that, John can work out what to do with his £10 note!

FFSHTRTHDX PRCLLKUT STRERMDRUS
FRENFTLSE RATRICTTNWD MNTNUSSCILGY

(see solution next month)

Solutions to March's mixed bag anagrams

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A3 > A4 > A5	Print yoffset: 8mm
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A310/A305 UPGRADES

RAM expansion

April

2Mb £99

4Mb £163

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The 2Mb board may be upgraded to 4Mb later. Educational and quantity discounts are available.

Impression 2

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8-chip design ensures low power dissipation.

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SECOND SPRITE

Converting sprites to draw files provides many advantages. **GRAHAM WALTERS** looks at a new package to help you out

Creating draw files from sprites, and your own outline fonts, are the benefits of a new software packages, called *Trace*. The advantage of converting sprites is that, quite apart from the considerable reduction in file size, draw files can be scaled and manipulated to any size, without any loss of resolution.

DOUBLE ACT

Trace actually includes two applications, *Trace* and *D2Font*. The former does the file conversion, while the latter converts draw files into outline fonts. Clicking select on the *Trace* icon opens the two main windows which, although initially blank, will eventually show the original sprite file and the converted draw file (see the screenshot below).

On the main menu, if a

draw file has been created, there is a facility to save it either to disc or directly into another program, otherwise this option is greyed out. It is also possible to save the sprite image itself. To initiate the tracing of the sprite, you use the *Trace* option and you can watch the draw file being created in the draw window – the pointer becomes an hour glass.

Choices leads to a submenu with two *Error* and *Save* options. *Error* determines how closely the draw file corresponds to the sprite file. A large value will give a poor rendering of the sprite file, whereas if the number is too small, it will reproduce the individual pixels of the sprite. A figure between 0.6 and 0.8 gives good results, although trial and error is required for a specific image. *Save* lets your

current *Error* value become the default setting.

Info tells you of the mode, number of colours and size of the sprite and draw images. If you have a number of sprites to trace, you can place them in a directory and drop this on to the icon. Another directory called *Draw* is automatically created and you can then trace each sprite in turn, placing the resulting draw file in this directory. After tracing, a sprite can be loaded into *Draw* for final tweaking, although this was not necessary for most of the sprites I tried.

The type of sprites that *Trace* definitely does not like, are those with any dithering or graduated fills – they generally give very poor results. However, by re-working these areas in *Paint* first, a better result can be achieved.

OUTLINE FONTS

The second application, *D2Font*, loads itself in the normal way. Clicking on its icon opens a grid window which has a small light grey character in the top left hand corner of each box, to show you where to drop each draw file.

One annoying point was that positions for Ascii code numbers 128 to 159 are shown in the grid as hexadecimal numbers. These characters in your font are accessed by pressing the Alt key and typing the character's Ascii code number, but it would be better if the Ascii code numbers were in decimal. Double clicking

Select over one of the character squares brings up a window showing a larger version of that character, complete with a red line underneath. This represents the base line of the character, which can then be resized by using either *Select* or *Adjust*.

Normally, you need to make red line slightly larger than the character outline. For characters with tails – such as a lower case p – the red line needs to be moved up to keep all the characters in line.

When you have finished compiling your grid, a *Save Font* option presents a directory icon that contains the *Outlines* and *IntMetrics* files. This directory is then copied into your current fonts application. One word or warning. Unlike a normal file, you can't rename a font directory to change the font name, so make sure that the font is saved with the correct name.

CONCLUSION

Both *Trace* and *D2Font* are very easy to use and perform their tasks extremely well. Overall, the package represents excellent value for money and is suitable for both school or home users.

PRODUCT DETAILS

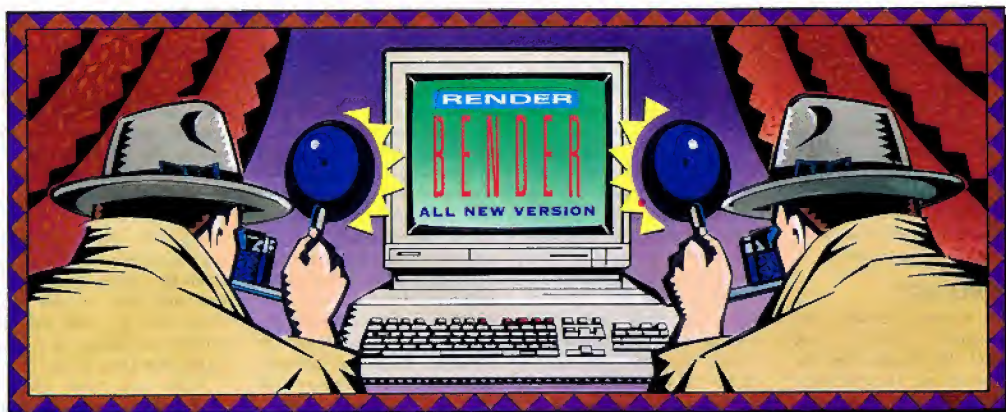
Product: Trace
Supplier: David Pilling, PO Box 22, Thornton Cleveleys, Blackpool, FY5 1LR
Price: £5.99
Machines: All Risc OS machines



Windows allow you to watch the sprite being traced into a draw file



What does everyone who creates moving pictures want?



A sneak preview.

Render Bender is the graphics package that allows the user to produce remarkable animated graphic sequences using Ray Tracing.

Ray Tracing isn't nearly as complex as it sounds. Basically, in a ray traced sequence, every pixel on the screen takes all relevant light sources into account. Ensuring that all the reflections and refractions are correctly calculated even if the light is reflected off several surfaces. The image could be no more faithful if you were filming real objects in real light. To produce such a superb animated sequence, however, was quite a difficult task – Until now.

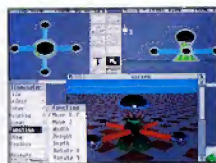
Illuminator has changed all that. It is a fully RISC OS graphical front end to Render Bender. Allowing the user to create a series of frames manually, or to give it a start point and an end point, leaving it to generate the frames in between. What you are getting is the ability to take a sneak

preview. You can see what you are going to get, before you get it. After you've created your outline frames in Illuminator, you then transfer the files to Render Bender, the fully RISC OS Ray Tracing part of the package. Which all means that now, to achieve powerful 3D Animation, you no longer have to be a mathematical genius. You just have to be the proud owner of Render Bender 2.

For more information please write to the address below for a Render Bender fact pack. We're sure you'll find it quite illuminating.

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MEMORY LAPSE

The A310 is sadly lacking in one vital area.

MALCOLM BROWN looks at how you can boost its memory space

Regular users of an Archimedes A310, not to mention the A305, will be well aware of the limitations of the memory supplied. For instance, if you load up *Draw* and *Edit* on the icon bar and then draw a reasonably complex figure, suddenly there's no room left to write about it.

The answer is, of course, to add more Ram. The A310 can handle up to 4Mb of Ram without flinching and several manufacturers have come up with upgrades which allow you to increase the power of the A310 considerably.

There are two sizes of Ram board commonly available - 2Mb and 4Mb. Bear in mind however that these sizes refer to the total Ram in your machine after fitting, rather than the amount of extra Ram.

The 2Mb upgrades use the existing Ram in your Arc. (If you have an A305 you may have to upgrade to 1Mb before fitting.) The 4Mb upgrades, on the other hand, add 4Mb of Ram to your machine, and the existing on-board Ram becomes redundant.

Since Ram is relatively low-priced, it makes sense to go straight for the 4Mb and this is the type we have chosen to look at in more detail. It's also a good idea to fit a Memcla upgrade (a memory control chip) while you're at it. Incidentally, if you believe that one day you might want an Arm3 in your Arc, bear in mind that some Ram upgrades limit your Arm3 choice. It is worthwhile checking with the manufacturers first.

The 4Mb upgrades fall into two categories - those you can fit yourself, as they can be simply plugged in, and those which you are advised to have

fitted by an expert, since they require some delicate wiring and soldering.

PLUG IN

With this type of upgrade (see our Watford and Ground Control boxes), fitting is simply a matter of removing the Memc and Arm chips, and fitting them into the sockets on the new board, then fitting the new board into the old sockets.

However, removing the two chips from the main board is not easy, even with the tools supplied from the upgrade manufacturers. You should also remember that these devices are easily damaged by static electricity - walking across a nylon carpet can generate up to 10,000 volts in your body!

WIRED IN

The cheapest option is a directly wired-in solution (see our Atomwide and Ifel boxes). The memory board is plugged into specially installed sockets. These are simple 16 and 18-pin sockets and cost only a few pence but you do have to do a lot more work to connect up to these lines. Many other connections must be made to various parts of the Arc's existing memory and to the Memc chip.

Removing the old memory chips and installing these sockets is not for the faint-hearted or the inexperienced. The upgrades are cheaper but if you do try it yourself, you could make some expensive mistakes. Instead, it is best to leave it to the experts and use the fitting service provided.

CHOOSING A BOARD

For this review we looked at two plug-in boards and two

ATOMWIDE

Price: £199

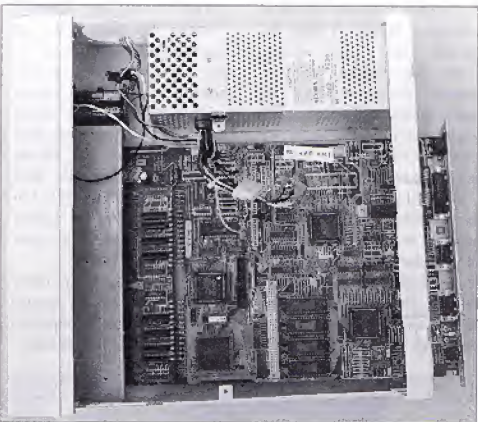
This includes a fitting service, courier service and a Memcla

Tel: (0689) 838852

This board is certainly not one to be fitted at home. Atomwide provides a collection and delivery service, as well as fitting - which just as well, this board is even more tricky to fit than Ifel's - 24

fiddly resistors need to be soldered into place. It looks extremely similar to the Ifel model and fits into the same installed sockets.

The Atomwide upgrade does have slightly fewer chips, but this is not really apparent to the end-user. This is a four-layered circuit board so there should be no line noise problems, even when the machine is subjected to the hardest working conditions.



wired-in boards. Unfortunately, the cheapest board around (£155 for 4Mb) from Simtec, (0772) 812863, was undergoing a design revision at the time of the test and so could not be included.

When making a decision, the first choice is whether you can bear to be without your beloved Arc for a day or so. If the answer is no, then self-fitting is the only option and you should go for Ground Control or Watford because of their installation simplicity. Of

these two, the Watford board must win out because it is a four-layer construction, but I would like to have seen some additional insulation.

The cheaper option, and perhaps the better one in terms of compatibility with further upgrades, and the likelihood of it staying put in your machine, is a hard-wired board. Ifel and Atomwide produce hard-wired boards and there is little to choose between them, since they are both both well designed and well made.

IFEL

Price: £219

This includes a fitting service, and overnight courier service, plus an Memc1a, and Rom upgrade board

Self fitting price: £199 (with Memc1a) or £163 (without Memc1a)

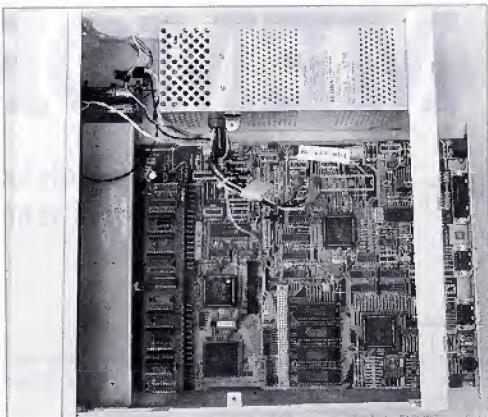
Tel: (0752) 847286

This is really a dealer-fit upgrade. Although Ifel welcome DIY fitting and the upgrade can be supplied with some excellent DIY instructions, only the extremely adept should attempt to fit this board at home. The Ram

board is quite small, without the need for Arm and Memc sockets. (It also provides enlarged sockets for Risc OS 3 chips, in anticipation of a possible plug-in upgrade).

As well as connection via the installed sockets, three wires connect to address lines on the Memc socket underneath the board. The whole main circuit board needs to be completely removed in order to fit this upgrade.

The Ifel Board is four-layered and is well made. It is a neat and long lasting memory upgrade.



GROUND CONTROL

Self-fitting board

Price: £243

Tel: (0635) 524008

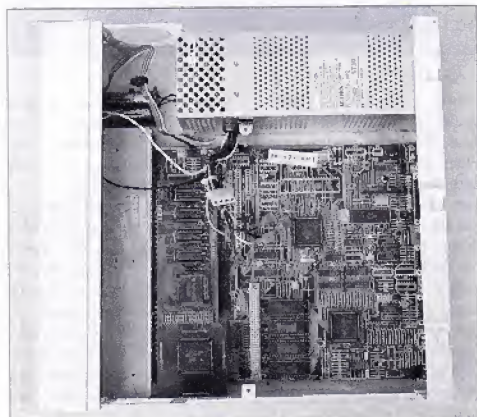
This board is of the easy, self-fit kind. At first glance it looks extremely neat and compact. However, all is not as it seems. First off, this is a two-layer board. It has no ground plane layer underneath the tracks on the surface: these are used to guard against electrical noise which can interfere with the data and corrupt the micro-processor operation.

What's more, the use of conventional (rather than surface mount) chip plugs and sockets has created a design with small sub-boards holding the sockets for the Arm and Memc. This lengthens the tracks at risk

from noise. Also, one logic chip on the board has several unterminated inputs – again bad design practice. However, it must be said that we found no problems of noise during the review and such troubles would usually only show up in a heavily loaded Arc.

Full marks to Ground Control for using the top quality McKenzie plugs for the Arm and Memc on this board. These require minimum force to insert them into the sockets. Just as well, since the fitting instructions suggest that you leave the main board in place, so it is put under some strain when you press home the new board.

All in all, rather more attention to detail would make this board cheaper to produce and a clear winner.



WATFORD ELECTRONICS

Self-fitting board

Price: £265

Tel: (0923) 237774

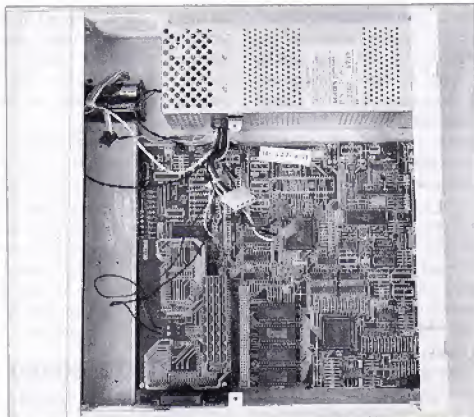
Another self-fit board, this upgrade is thoughtfully supplied with a chip removal tool for the Arm and Memc. However, this is not necessary, since a small screw-driver works much better. Also provided is a new floppy drive cable – the Ram board gets in the way and a longer cable is needed to snake around it.

Once the Arm and Memc chips are removed, the upgrade board is plugged into the empty sockets on the motherboard. A second board then slots into place and is used to hold the relocated Arm processor. So to

upgrade to an Arm3 simply involves unplugging this second board.

Again the instructions say to leave the main board in place during the installation. Given Watford's choice of low-cost plugs, more pressure was required to fit the upgrade to the main board, putting it under some strain.

The smaller board fits up against the metal side of the Arc and is insulated with only a sheet of clear plastic. This could easily be pierced by a pin causing a short circuit and on the review sample, this had already happened. However, the upgrade is otherwise well-made. It is a four layer board (although the sub-board is only two-layer) and, if you add a bit more protection to the smaller board, it is an excellent design.



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WORK OF ART

Is this the moment that designers have been waiting for?

ROB MILLER looks at the release of ArtWorks

Computer Concepts is a company renowned for its high quality software. One case in point is its desktop publishing package *Impression 2*, which is used to produce *BBC Acorn User*.

So the announcement of *ArtWorks*, CC's new design package, has been causing something of a stir among BBC A3000 and Archimedes users. Will the new package do for design what *Impression* has done for DTP? We were invited by Computer Concepts to have an exclusive preview of the new *ArtWorks* package.



ArtWorks is best described as a high-quality design package and was used to create all of the images shown here, including the very impressive picture of a Mini, shown above.

The package is designed to be easy to use, yet is also sophisticated enough for the professional user. So what is *ArtWorks* capable of?

OBJECT-BASED

Firstly, *ArtWorks* is not a painting package. Although it is used to produce pictures, it is an object-based program (in the same way as *Draw*) and

builds up images of lines and shapes, rather than using individual pixels.

Every object within *ArtWorks* – whether it be a line, shape or text – is treated as an individual item and can be changed independently of those around it. *ArtWorks* is also a modular program, made up of many smaller modules which combine to form the complete package. When run, a control program loads in each module from a special directory and installs it within the *ArtWorks* environment.

STARTING UP

Like *Impression*, *ArtWorks* requires a dongle (a small black box) to be fitted to the parallel port of the machine before it will operate. Much

has been said about the use of dongles, both for and against, but I think they are a good way for software companies to protect against piracy – and they do not really effect the user once they are in place.

Running *ArtWorks* produces a start-up window displaying the version number of the software. A selection of icons then appear in the window, signifying which modules are being loaded into *Artworks*. It is then installed on to the icon bar.

A number of features from *Impression 2* have been carried over to *ArtWorks*. Any number of pictures can be loaded (or created) simultaneously, given that the host computer has enough memory. Different documents can be viewed (if loaded) or removed



Just one of the samples from the ArtWorks gallery

from *ArtWorks* as normal. Also, different preferences can be set up that affect the overall use of the package. Selecting

the preference option displays a menu covering the different tools available. Key shortcuts can be customised to allow quick access to different tools.

You can alter: angle constraint (which effects the angle that objects can be rotated to); page units; font units; the appearance of the text cursor; the appearance of the toolbox; and the way in which draw files are loaded to, and saved from *ArtWorks*.

As there are now two different *Draw* formats (Risc OS 2 and Risc OS 3) *ArtWorks* needs to know which one it is dealing with. There are also some features in *ArtWorks* which cannot be shown directly in *Draw* – graded fills for example – so there is also an option to set the quality level in a picture when converting from one program to the other.

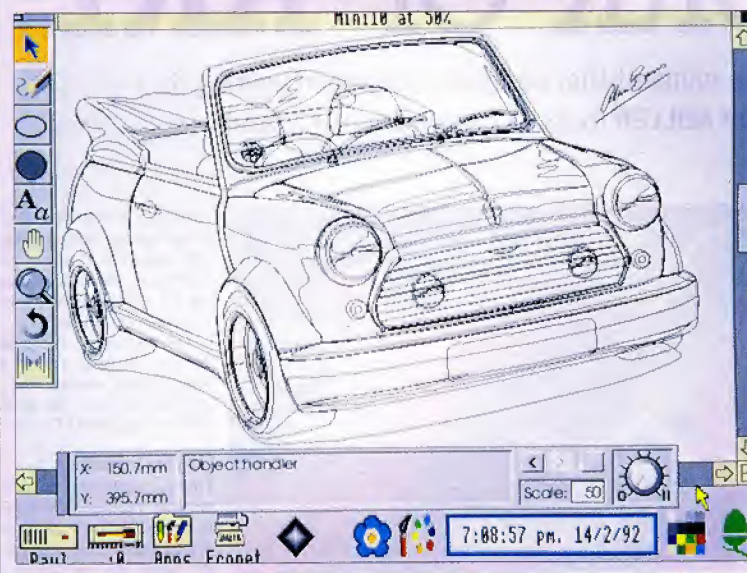
HOW TO DRAW THE LINE

The Mini car shown on the previous page was initially produced from a detailed line drawing, making the line tools one of the most important parts of the entire *ArtWorks* package.

Three line tools are provided; straight, curved (or bezier), and freehand. Users of *Draw* (myself included) often take some actions for granted. *ArtWorks* has been written to be as intuitive as possible so there are a few basic changes that can initially take some time to get used to. The Line drawing tool, for example, only joins points when you click on a new point. There is no continuous 'rubber-banding' as in *Draw*, although lines can be dragged around by holding down the select button on the mouse whilst drawing. Filled objects can be created by just dragging the start point of a line

over the end point whereby they 'snap' together. Curved lines are created in a similar way to straight lines; select a new point and *ArtWorks* will draw a line between that and the last point. Like Bezier lines in *Draw*, each point has two associated control points which effect the shape of the curve.

Moving one of the control points will automatically move the other in order to maintain the roundness of the curve. 'Sharp' points can be made by selecting a special corner option on the Info box. Freehand lines can be drawn by just doodling with the mouse as you would in a normal painting package. *Artworks* will then take the squiggle and attempt to fit a curve along it. The level of accuracy can be set with a slider control and the results are impressive, especially with a fast Arm3 machine.



RUNNING ARTWORKS

Clicking on the *ArtWorks* icon produces a blank window and clicking on this brings up two other windows – the toolbox and the info bar.

Both windows are panes, meaning that they are actually a part of the main window and move about whenever the main window is repositioned. This option can be changed in the preference menu.

In keeping with the modular nature of *ArtWorks*, tools are organised into obvious groups in the toolbox window. Tools of a similar nature that are not shown on the toolbox can be accessed by clicking Menu, as you would with a conventional Risc OS menu. The toolbox itself is editable: tools can be rearranged, removed or added

to customise it to the user's requirements. You can drag tools from the sub-toolbox to the main one, but dragging tools from the latter removes them and places them in the appropriate sub-toolbox.

The info bar plays a less active role. It displays a constant readout of the mouse position (in millimetres) and also the scale of the current drawing, easily altered by typing in a new percentage. However, two of *ArtWorks*' most useful features are controlled from the info bar – the undo/redo feature and the Wysiwyg (what you see is what you get) control.

Any operation can be undone by clicking on the left arrow or redone with the right arrow, and it is even possible to perform multiple undos to take a drawing back to the beginning. The undo list is saved with its associated drawing, as part of an *ArtWorks* file, and will record all actions required to create that particular illustration. But you cannot rely on it completely: there are cases when it is impossible to redo an undo, such as when deleting a complex object. A warning will be issued if you attempt such an action.

The Wysiwyg control knob allows the level of rendering in a picture to be set from simple outlines to fully shaded objects. The dial runs from one to 11, one being outlines and 10 being fully filled in objects. When set on 11, all lines are anti-aliased, producing a very clear display in any 256-colour mode, particularly when using

a multiscreen monitor. Generally, the picture quality, even in 16 colour modes, is excellent, especially if the primary palette feature is selected. This sets the desktop palette so that a full colour spectrum can be displayed using dithering.

Panning or scaling the main window can take some time, especially if you are working on a complex drawing, so a special button on the info bar allows you to update the picture in the background.

IMAGE CREATION

So, how do you go about creating an image with *ArtWorks*? Well, as we said earlier, this is an object-based application, and there are only two basic objects in *ArtWorks* – lines and shapes. A line is just like a path in *Draw* and consists of a number of points with a start and end, while a shape is any line that has its start and end points joined together.

Pictures can then be built up by drawing lines and shapes of any colour together and then editing each object until you like the results. The tools used to build up a picture can be split into two categories – those that create objects, and those that change or manipulate objects in some way. These tools deal with different aspects, including lines, shape colours, and other useful features, such as zoom.

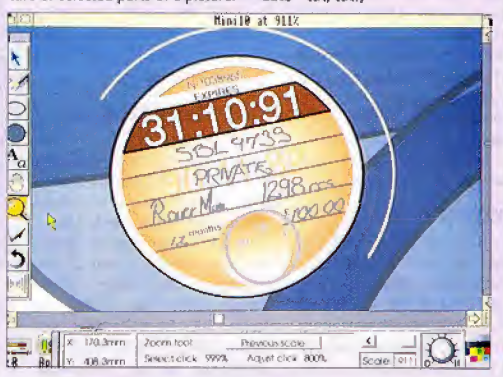
TEXT

All text is stored in modular form, in keeping with the rest of *ArtWorks* and is regarded by the program as a shape (or

ZOOMING IN

One of the most impressive *ArtWorks* tools is the magnifying glass used to zoom into the entire picture or selected parts of a picture.

Here we have zoomed in on the tax disc of our original Mini (which just happens to be out of date – tut, tut!)



shapes). This means that text can be typed in, rotated, shaded and can still be edited at all times. A new FontManager is provided with *ArtWorks* to allow rotated text, even in Risc OS 2. Text files can also be loaded in and edited, even after rotation and filling.



Although not available as yet, it will also be possible to have text squashed into envelopes (see section on moving) and still be able to edit it.

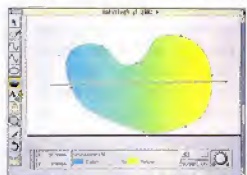
The caret will even change shape according to its whereabouts on a line.

SHAPES AND FILLS

Three shape tools give ellipses, rectangles and rectangles with curved corners. All three tools can be 'restrained' (by holding down the CTRL key on the keyboard) to produce regular shapes, such as circles, squares and rounded squares. The CTRL key is also used when another sort of 'locking' action is required: namely scaling and rotation.

But one of the most impressive features of *ArtWorks* is the graduated fill. In *Draw*, if you wish to 'shade' objects, a number of multiple objects have to be overlapped and

coloured to fit the required scale. While *Draw* lets you do this automatically in Risc OS 3 the resulting file is large and awkward to edit. In *ArtWorks*,



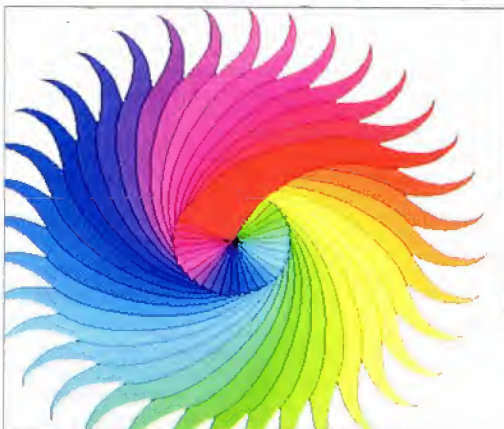
however, you merely specify a start and end point, and the two colours to fill between, and – hey presto – there it is (see picture above).

Fills are stored as just those items, thus saving a great deal of memory. Another advantage of *ArtWorks* is that they are shown as one smooth graduation, using *ArtWorks*' own special dithering routine.

COLOUR

Because *ArtWorks* is a 24-bit, full-colour illustration tool, likely to be used up to professional level, a lot of care has gone into colour selection and the provision of a wide range of colours (shown left). Selecting colours for filling is simple and is done in much the same way as selecting styles in *Impression 2*. A basic list of shades is always available – eight greys and eight colours.

The list can be added to by selecting a current colour and altering it using one of three techniques; RGB, HSV and CMYK. RGB (red, green and



The colour range is an important part of the *ArtWorks* program

blue) is the method used in the Rise OS palette utility. HSV is hue, saturation and value, hue being the general colour from the spectrum, saturation the strength of the colour and value the level of black within the colour.

CMYK is a special method commonly used in printing and refers to the amount of cyan, magenta and yellow ink required for each dot in a picture. The K stands for key and is the level of black needed.

MOVING

Any line or shape can be rotated or scaled around a movable point. The CTRL key can be used to fix rotation to steps of any predefined angle or to force objects to scale in both width and length.

Those who have used programs such as *DrawBender* and *BBC Acorn User's* very own *Stretch* program, will be familiar with the effects of the envelope tool. Rather than try to explain it, take a look at picture opposite which shows our familiar BAU logo, before and after stretching, using the envelope shown. By moving the control points on the

envelope, any object within it can be stretched or squashed.

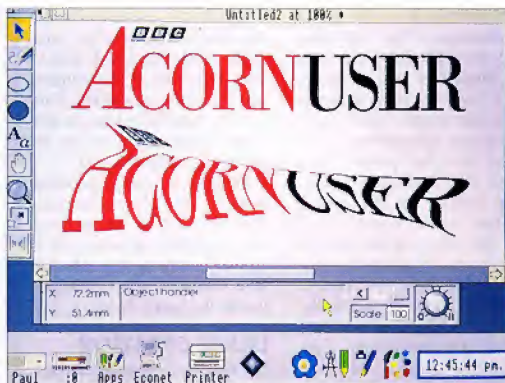
The perspective tool can also alter the shape of an object by dragging the points on to a quadrilateral, surrounding the object. The resulting picture is shown in true perspective, instead of being merely squashed.

THE COMPETITION

So how does *ArtWorks* compare with the design giants such as *Corel Draw* on the PC and *Aldus Freehand* or *Adobe Illustrator* on the Apple Mac.

Firstly, a number of things are very similar, such as the fountain fills from *Corel Draw*, plus the ability to import files from the three programs above. This means that *ArtWorks* has an immediate picture library. Loading a *Corel Draw* file is just a case of using a PC disc reader (already present in the new A5000) and dragging it in.

Users of illustration programs on the PC and Mac should have no trouble getting to grips with *ArtWorks* – once they become familiar with Rise OS. Computer Concepts has made the transition easier



The envelope tool allows for some highly versatile shaping

by including a utility, *FlipTop*, which allows you to change mode by just selecting the resolution and number of colours needed.

Where *ArtWorks* goes further is in its capacity to exploit the advanced features of the Archimedes, which makes it incredibly fast to use. Timings made, comparing programs such as *Corel Draw* running on 486-based PCs with *ArtWorks* running on an Arc with an Arm3 processor, showed that a typical redraw speed was up to five times faster with *ArtWorks*.

THE FUTURE

Because *ArtWorks* is modular in design, tools can be removed or added to the program. This means that in the future, it will only be necessary to add or replace existing modules if you want an updated version of *ArtWorks*.

Computer Concepts is hoping that third-parties will design their own *ArtWorks* modules and a reference manual will be available for those wishing to do so.

A typical example of an later addition would be, say, a graph module that could then, in turn, make use of *ArtWorks'* existing fountain fill and perspective tools. The list of possible add-ons is virtually unlimited and I can imagine a whole flood of them just as soon as the main program has sold a few copies.

In addition to the features outlined (no pun intended) it will also allow text to be typed around a curve, real-time in-betweening from one object to another, a grid facility for

accurate drawing and smart-duplicate feature to allow repeated patterns to be created simply.

CONCLUSION

Although they both operate as object orientated graphics packages, comparing *ArtWorks* with *Draw* is rather like comparing *Impression* with *View* (on the BBC Master). Both do basically the same thing, but the former application is the only choice if you want high-quality output.

Many effects that would take a long time to produce in *Draw* can be achieved in seconds with *ArtWorks*. The overall speed and friendliness of *ArtWorks* makes it possible to experiment with ideas, thus aiding productivity. Given time, patience and a little bit of artistic skill, the results can be astounding, as some of the examples here demonstrate.

With the addition of Computer Concept's Colour Direct printer (see this month's Graphics page) it forms what is perhaps the easiest to use, but most advanced graphic illustration package, on any personal computer today.

ArtWorks should be out by late spring and, despite being aimed at the professional user, I can see it becoming as popular as *Impression* is today.

PRODUCT DETAILS

Product: *ArtWorks*
Price: Under £200
Suppliers: Computer Concepts
Tel: (0442) 63933
Machines: All Rise OS machines
Release date: Late spring



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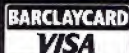
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Making backups doesn't have to be a tiresome chore.

GRAHAM BELL

looks at a simple solution

GETTING YOUR BACK UP

The essential problem with backup software is that it is less entertaining than playing games – so playing a game always seems a better way to spend that spare hour. Even the tiniest nuisance factor in the program will seem like a major fault. And, unless you make backing-up part of your daily or weekly routine, then it will probably never get done.

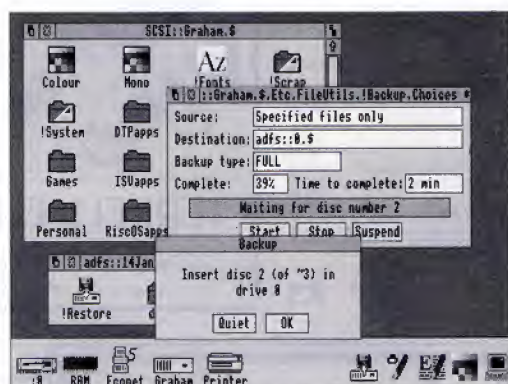
Beebug's *Hard Disc Companion* aims to make the process more palatable and version two improves on and tidies up on a lot of the loose ends in version one.

Backup is the usual icon bar application. It opens a simple dialogue showing the current choices: the main directory to backup, the place to back it up to and so on. A menu allows you to choose between a full backup, or two types of partial backup. A differential backup is every file that has been changed since the last full backup, whereas the incremental type is everything since the last backup.

WAYS AND MEANS

The best way to use this system is to do full backups regularly and then do differential backups every day. That way, two sets of discs are all that is ever needed to restore your work.

Specifying the backup destination is a simple matter of dragging a directory icon to wherever you want to put your archive (on another hard disc, say). Or you can choose the default, ADFS:0.5, to put it all on floppies. In contrast, choosing which source to back up is completely counter-intuitive: you drag an icon from the Backup window into the direc-



A full backup of pre-selected files on to floppy discs

tory you want to back up, rather than dragging the directories into the Backup window. However, there is a flexible way of choosing individual directories and files to back up by dragging them into a window, and a way of excluding files and directories by name or even by filetype.

Once you have chosen your source and destination, you can save your choices as a sort of script file – double-clicking on that file in future will repeat the same backup procedure. This is good for formalising the full/differential routine: you could keep two script files called Day and Week.

As the archive is created, it prompts for new floppies to be inserted and it names the discs in numerical order, formatting them as well, if necessary. It's reliable and you can pause at any time to do something else, or even carry on typing in a wordprocessor – it works pretty much in the background. There's no problem with long files: they are compressed and, if they are still

too long to fit on a single disc, they are split. Compression is much improved: version one contained a short list of filetypes which it would compress, and few people bothered to add to the list. Version two tries to compress almost everything except very short files. And you can tune it (by editing the Messages file) to try harder if you have an Arm3.

How much compression is achieved varies immensely: a typical mix of data files compressed to about 55 percent of its original size, but a 2.5Mb Impression document with lots of sprites reduces to 13 percent. Despite the compression, be ready with about 80 floppies to fully back up your 100Mb hard disc, and put aside a couple of hours.

The archives that Backup version two creates are self-extracting to an extent – it puts Restore and Retrieve applications into the archive, along with the data, so you can always get your stuff back, even if your only copy of Restore was on your crashed

hard disc. Unlike version one, Restore can only be used to get back the entire collection of files. Retrieve is the new application to get back selected files – but you have to remember the filenames. There's a wildcard search for filenames in an archive, but if you have to browse, you too often get the error 'window full' when you can't quite remember enough of the name. Also you cannot search for a file of a particular type.

If you do find the file, then you just drag it out to retrieve it, but it would be better if Retrieve showed a tree view of the files and directories in the archive and allowed you to select both individual files and whole branches of the tree, like the old Mitre *Discree*.

It is also worth noting that some applications, notably Beebug's own *Ovation*, cannot be run from a restored copy.

CONCLUSION

Overall, *Hard Disc Companion* is a good but not a great backup system. It's convenient to use, with fewer rough edges than version one, better treatment of new filing systems and better compression: a worthwhile upgrade. Unlike *Spark*, it splits long archives over several discs, it's faster and it compresses practically as well. But it still isn't perfect, particularly for network filesystems, where a tape system is better.

PRODUCT DETAILS

Product: Hard Disc Companion
Supplier: Risc Developments
Tel: (0727) 40303
Price: £45 plus VAT (or £15 for an upgrade from version one)

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(See review in Feb '87 and Aug '89)

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Such is the enthusiasm for **Euclid** there is a user group called **Elements**, now in its second year, which provides a quarterly disk containing hints, tips, animations and user pictures.

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ACTION REPLAY

PAUL JAMES examines the new full motion video system from Acorn

The *Hitchhikers Guide to the Galaxy*, that renowned book, radio and television series, provides what is probably the most famous example of where multimedia could go in the future.

It featured a hand-held computer which knew absolutely everything about the universe and was frequently consulted by Ford Prefect on his travels through space and time. Ford would ask the computer a question and the little electronic book would launch into a narrated, animated sequence, to throw light on to the subject in question.

Today, the race is on in the computer world to turn massed information into a kind of 'virtual reality', with particular emphasis on moving video images. Now Acorn has joined the fray with its new full motion video system - Acorn *Replay*. Aimed primarily at developers, it will undoubtedly hasten the impact of multimedia in the Acorn market.

DATA HANDLING

Until now the major hurdle when using motion video has been the sheer size of the files involved. It is not just a case of saving one image, but a whole sequence. The storage and loading of such sequences are the biggest problems, but *Replay* tackles both by using existing hardware and some very clever software.

CD-Rom systems can store large amounts of data. Just one plastic compact disc can hold around 96,000 pages of text - and that's before compression, which can in some cases, reduce the size of a chunk of data by 20 times or more.

An increasing amount of data is being transferred on to CD-Rom format. Encyclopedias, newspapers, reference manuals and books (including



Acorn *Replay* - full-motion video capability on the Archimedes

the Bible) are now being turned into data which can be read by the computer, decompressed and finally shown on the screen.

But until recently, CD-Rom players have not been able to produce moving picture sequences on the computer screen because of their inherent slowness. A decent-sized picture - say, a quarter of a mode 15 screen - consists of around 40Kb of data. To get the 12.5 fps (frames per second) needed to fool the human eye into seeing a fairly smooth-running image, the computer needs to suck about 4,096,000 ones and zeros from the player per second. With current mainstream hardware, that is just not possible.

However, if each video frame is compressed, then it is possible to get 12.5 frames of data per second from a CD (25fps from a quicker device, such as a hard disc). The computer then has to decompress this data and place it on to the screen - no mean feat.

This is what Acorn *Replay* achieves. With a standard hardware device (either a CD-

Rom or a hard disc) containing the movie file, the decompression and display can be handled by the *Replay* software. The fact that no special hardware is needed is what makes *Replay* so cost effective, compared with other hardware-based solutions.

The compression techniques are the key to the *Replay* system, (see box) making it possible to fit a 12sec, 12.5fps film on to a single floppy disc.

Acorn has also thrown in multiple channel, stereo sound.

CONCLUSION

Acorn *Replay* opens up new multimedia options. Moving pictures are instantly impressive and guaranteed to grab attention. Used in the right circumstances, they are far more informative than text, one example being a short movie showing how to operate a piece of equipment. An A5000 with a built-in video tutor? Well, memory would be a problem, but it is possible.

Although *Replay* is not aimed at individuals (the Archimedes system needed to make the sequences has to be powerful and requires expensive additional hardware), it is sure to be picked up by software developers who, by incorporating the compression and decompression facilities, will be able to include moving pictures in their own packages.

Support for *Replay* has already been included in the *Magpie* and *Genexis* multimedia packages. Before long, we could see many applications, released on CD-Rom, that include moving pictures.

HOW REPLAY WORKS

Acorn *Replay* is primarily aimed at software developers. The sequence, in the form of a video or similar media, is passed on to a company who will then master it and put it on to a large storage device, uncompressed. The first part of the *Replay* software then comes into play.

First, the video data is reduced to Archimedes' sprite format, then each frame is taken in turn and compressed. At this stage, the compression is simply a case of removing data from the image - and it is no loss, since this is data that the human eye is unable to see anyway. Areas which include several, subtly different colours are evened out, and highly detailed areas are smudged. Then a form of Delta compression is used, which relies on the fact that only one part of the picture is moving, while the rest is stationary. As the computer already has the data for the stationary part, it doesn't need it again, so this is disposed of.

Finally, the finished *ArmMovie* file is placed on to the hard disc or mastered on to a CD-Rom. This method allows about 6Mb of film in Archimedes format (this would be far bigger in original video format) to be compressed down to fit on to one 3.5in floppy disc (about 800K). This is worth 12sec of 12.5fps video.



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LOOKING AT THE FAX

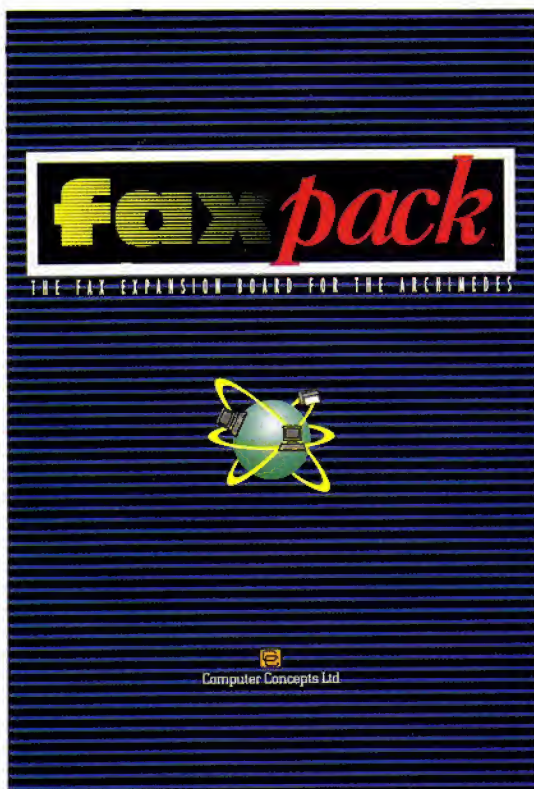
With the Archimedes attracting increasing interest from business users, **GRAHAM BELL** looks at a package which can turn your Arc into a fax machine

One of the icons of modern technology is the facsimile machine. The need for fast communication means faxes are now found in most offices.

Combining fax and computer technology makes sense – in principle, a Archimedes with a printer, scanner and modem can operate as a computer system, photocopier or fax machine. Add a sound sampler and you have an answering machine too.

FaxPack from Computer Concepts is a fax expansion board which turns your Archimedes/BBC A3000 into a fax terminal. It first appeared some years ago, but it fell foul of problems with Arthur, the original operating system for the Archimedes, and was withdrawn. With the advent of Rise OS plus the *IRQuills* and *Hourglass* modules, these problems have been solved. Fax chip technology has also advanced greatly, so CC has re-designed the product.

The new package comes in the form of some software, plus a half-width podule which slots into the back of the Archimedes and connects with a phone line. Fitting to the Arc is easy enough, but you do have to be careful with a tiny ribbon



cable used to attach the fax card to the sound input of the machine – it inserts differently on each model of Archimedes (300 and 400 series, 540 and A5000). There is also adaptor so that you can plug your normal telephone and *FaxPack* into the same phone socket.

With a BBC A3000, you can connect up the card via the external podule connector on the back, but you can't fit the audio cable. You must also remember to put the podule in a case – it is far too vulnerable if you leave it sticking out.

APPLICATIONS

Once set up, there are two applications to be copied from the software disc: the a normal printer driver, *PrinterFP*, and second *Faxmgr*, used for configuration of *FaxPack* and for fax reception. It is separated from *PrinterFP* so that you can still receive faxes when you load another printer driver – perhaps to print out a previous fax, for example.

Configuration is mostly a matter of selecting yes or no from a list of options – for example, whether to use touchtone dialling (if you are attached to a modern digital telephone exchange), or stick to old-fashioned pulse dialling. You should also enter your own telephone number. Fax machines identify themselves to each other, and your number will show up on the machine at the other end.

Sending your first fax is almost as simple as printing. You need both *Faxmgr* and *PrinterFP* on the icon bar, then you enter the destination fax number in a dialogue box and choose print from any application that uses the Risc OS

HOW FAXES WORK

Faxes have much in common with familiar computer peripherals. A conventional fax machine is little more than a specialised 9600baud modem teamed with an A4-width scanner and printer. The scanner scans the document, and the image data is transferred to the modem and on to another fax machine, where it is printed. In fact, the image is compressed before transmission, so it takes less time to transfer the data for each page.

Most modern fax machines are known as 'group 3', which means that the scanner and printer work at up

to 200 dots per inch – about dot-matrix printer quality. But the majority of machines have 'normal' and 'fine' scanning modes, normal being quicker because it is only 100dpi. Combined with imperfections in the scanning and crackly phone lines, it means that most faxed documents are of questionable quality.

To boost the quality on poor phone connections, most group 3 machines step down from 9600baud to 7200, 4800 or even as slow as 2400baud. But there is no standard for error-correction, because a single wrong dot on a page doesn't ruin a faxed image.

printer drivers – *Edit*, for example. When you print, *FaxPack* assembles the page in memory in seconds, then dials the number. If it connects to a suitable fax machine at the other end, it sends your document. You get control of the computer back as soon as it is assembled – the fax data is transmitted in the background, and even on an Arm2 machine, it is barely noticeable.

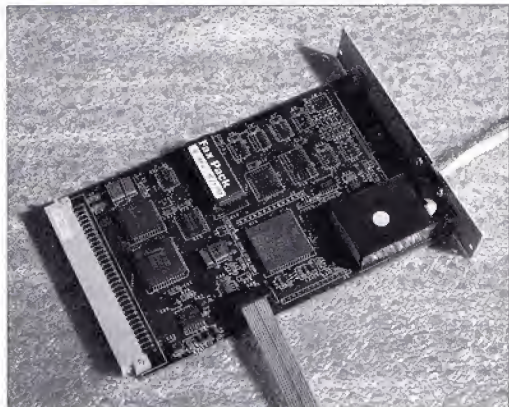
The sounds made during dialling and sending of the data are important, since without sound you don't get any indication of what's happening – your fax just goes. If it fails to, because the receiving machine is engaged or won't answer, an error box pops up on the screen. Unfortunately, there is no sound on the A3000.

BETTER QUALITY

Faxes received from *FaxPack* look much better than from most dedicated fax machines: straight lines no nasty streaks etc. With conventional faxes, most errors occur at the scanning stage (which *FaxPack* avoids) rather than in transmission or printing. After transmission over normal telephone lines, even six-point text (this is nine-point) is readable.

However, it is worth turning the Quicktext option off. This is 'Computer Concepts' replacement for Acorn's font module, used in both *FaxPack* and the Laserdirect printers. Although it works well on a Laserdirect printer, where the resolution is 300dpi (dots per inch) or greater, at *FaxPack*'s 200dpi it tends to miss out pixels in thin horizontal curves – the tops of the 'e', for example. Although it is slightly slower, Acorn's font rasteriser draws skeleton lines through these curves to make sure the letters are continuous. Quicktext ignores the skeleton lines and leaves gaps where the outline is thin.

FaxPack adds a page number to the top of each page, and can include a running header. It slightly distorts the document, making it a bit narrower and longer than a 'true size' printer, but this isn't really a problem because of the informal nature of fax communications. However, stick to A4-size paper and be generous with the page mar-



The FaxPack half-width module connects the Arc with a phone line

gins when setting up a document, as there can be no indication after you've sent a document that it will be completely legible at the other end.

The final software was not available for this preview, and certain features destined for the release version were missing. For example, if you forget to enter the destination fax number in the PrinterFP dialogue box, it pops up an error box when you 'print'. The final software will pop up a box requesting the number to dial – much better. It would be even better to be able to drop a text file containing solely the fax number on the printer driver icon – for example by

dragging a field out of a *Squirrel* or another database.

Other untested features of the software include keeping a log of fax traffic, and the intended *FaxPack*-to-*FaxPack* file transfer, enabling a file or whole directory to be transferred between *FaxPack*-equipped machines – you will be able to just drag the file or folder on to the PrinterFP icon.

RECEIVING YOU

Setting the *FaxPack* up for reception is quite straightforward. You need to set up a directory to receive fax files into, and you need to be running the Faxmgr application. Just how you do this varies: if

you are blessed with two telephone lines, one can be dedicated to fax traffic, and you can set *FaxPack* to auto-answer. For a more normal setup, where *FaxPack* has to share a line with ordinary telephone conversations, you can't have *FaxPack* answering all your calls with its ear-piercing whistle. You can set it to manual answering, then whenever you pick up the phone and you hear a fax tone from the other end, you use the Faxmgr menu option to begin reception. During reception you can continue with something else, since it all happens in the background and won't disturb normal work.

The quality is not as impressive as faxes you send, although it depends on how good the fax machine is at the other end. But you can read fax files simply by clicking on them. The reading application is simple, with little more than a page up/page down interface. It would benefit from an option to rotate from landscape to portrait, but it is easy to print or read the fax on-screen, crop out a section, or save it as a sprite. The latter option does have problems though, as the sprite files do not work directly with *Paint*.

You also need to clear out your fax directory fairly frequently, as each page takes up to about 150Kb of disc space – don't consider *FaxPack* unless you have a hard disc.

CONCLUSION

For business users, who may be judged on the speed and quality of their output, or for general users who want to communicate with each other, *FaxPack* offers solutions. You can use it with almost any printer driver-aware application, and most of the others would work with the supplied LQemulate application that can make *FaxPack* appear like an Epson dot-matrix printer.

FaxPack works well, offers impressive results and represents exceptional value.

PRODUCT DETAILS

Product: FaxPack
Supplier: Computer Concepts
Tel: (0442) 63933
Price: £299 plus VAT
Machines: All Risc machines

FAXPACK SMARTCARD

The FaxPack module is one of only a few Archimedes expansion cards provided with its own intelligence. As well as the dedicated fax modem chip that handles the telephone line, there's an 8031 8-bit microprocessor that does most of the work. It only interrupts the Arm chip to transfer chunks of data to or from the dual-port Ram on the module – a simpler board would use the Arm to transfer individual bytes of data and to control the fax chip directly.

The PrinterFP software shares many features with the Laserdirect, and it first assembles the page in a compressed form in the Archimedes memory. You can configure the amount of memory used and, because of the lower 200dpi resolution of fax, it doesn't need to be a big buffer: 512k is ample.

The current versions of PrinterFP and the Laserdirect drivers share a serious problem when printing out from Squirrel: text fields consisting of more than one line of text can't be printed – a huge black block is all that appears on paper. However, this isn't a problem with any other applications, and text, sprites and drawings are all correctly incorporated into your faxes.

Future software upgrades intended for the FaxPack (and for Laserdirect) include a networkable version which splits the printer driver in two – half at your workstation, half at a 'fax server' on the network. The communication between the two is at Draw-command level: this should clog the network much less than Oak Solutions' current networked version of the Laserdirect driver which transmits the compressed bit-map of the entire page over the net, and should allow printer messages to be routed back to the correct workstation.

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Transputer Systems

Gnome Computers offers a complete range of transputer boards to fit into either RISC OS or RISC iX based Archimedes machines. Prices start at £1385 for a single 10 MIP, 2 MFLOP transputer system including a parallel FORTRAN-77, C, Pascal, Modula-2 or Occam compiler.

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Free software – sounds too good to be true, doesn't it? Well, that is exactly what Public Domain (PD) software is all about.

In the earlier days of Beeb computing, PD grew mainly from the programming arena. Enthusiastic home users wrote simple programs to solve specific problems – then these solutions were shared out among other users.

Over the years these 'freebie' programs have become known as Public Domain (PD), which means that you can copy and distribute the programs, usually within a set of basic ground rules, such as not altering the program files or code, leaving the author's name intact and not making any commercial profit from distribution.

The past few years have seen a steady build-up of PD program titles for the Acorn range of computers. Some have evolved to such an extent that they now rival commercial software products and represent excellent value for money, usually only costing the price of a disc and postage.

At this point, I should point out the difference between PD software and shareware software, over which there has been some confusion in recent months. Whereas PD software is free to copy, use and pass around, shareware software is free to copy and use only for a limited period.

However, if you use shareware software continuously it is customary to send the author a donation. This in turn gives the author incentive to produce more programs in the future. Some authors will also send you updated versions, or even a manual, if they receive such a donation.

EASY ACCESS

There are numerous ways to get hold of PD software. The easiest is probably by browsing through the Software Showcase pages at the back of *BBC Acorn User*, where advertisements can be found for a handful of PD libraries. Most have a demonstration disc that gives a rough indication of what software range they supply, and you can usually buy the demo for a pound or two.

Another way of obtaining PD software, if you have access to a modem, is via one of the various bulletin boards, which often contain many megabytes of software that you can download for the cost of a telephone call. However, if you are downloading, check the length of the software before you start – it can cost more to download a program, in terms of telephone charges, than to send off for a disc.

Another thing to bear in mind when obtaining PD software is the spread of viruses. Luckily, most PD libraries are fairly diligent and, personally, I have never found a virus on any PD discs. Bulletin boards are perhaps more likely to be infected, but again, most Sysops (system operators) regularly check their downloads for infection. If in doubt, obtain a virus checker which many PD libraries can supply.

As PD software covers practically any subject you can think of, we can really only give you a taste of what is around. Here is a selection of some of the more impressive titles – if you are a subscriber, all of these can be found on our *BAU* subscribers' disc, but you can also obtain them directly from the PD distributors – see our Where to Go box for more details.

GUESSTYPE

All Archimedes machines
Digital Phenomena PD

Guesstype is a handy little icon bar utility which will be of great use to bulletin board users or anyone who has accidentally changed the filetype of a file. How often have you received the error 'No run action specified for this file type?' When you encounter a file that has no file type, which you may have downloaded without re-setting its filetype, simply drag it onto the *Guesstype*'s icon and it will examine the contents of the file to have an intelligent guess at what its filetype should be.

This obviously works best on database and specialist application files which usually have some recognisable data at the beginning of the file. Files containing pure text are generally all recognised as filetype &FFF (text). When *Guesstype*

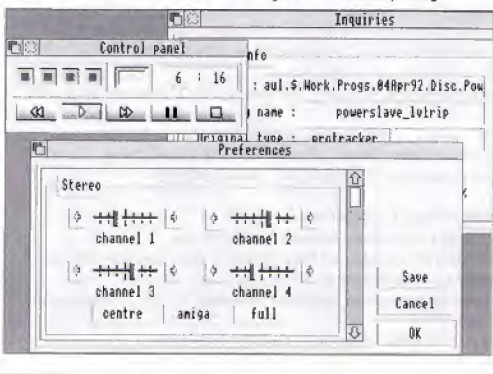
FREE FOR ALL

Can you really get something for nothing? **PAUL VIGAY** rounds up the best Public Domain software available for the BBC and Archimedes machines

KEEPING TRACK

- ProTrack – Soundtracker player routine
- All Archimedes machines
- Arcaynia PD (written by Bass)

One of the more prolific areas of PD is the range of demos and sound-tracker tunes available, many ported from other computers, such as the Amiga. Hugo Fiennes wrote the first Archimedes program to playback tunes from Amiga SoundTracker, a program which over the years has been extended and modified to become a slick and professional-looking program. ProTrack has been produced by the Belgian Archimedes Software writers, Society, and is an impressive addition to any PD collection. Running from the desktop and totally Risc OS compliant, ProTrack will play any tracker tune, as well as provide you with a range of control panels enabling you to examine and control the tune in more detail. Four panels are provided: a control panel which lets you fast forward, play, rewind, stop or pause the tune currently being played; an enquiry window, which allows you to examine more specific details such as the tune length, number of samples used, memory size and effects used; a monitor screen, which lets you see the actual tracker data and musical waveforms, together with a spectrum analyser type display, all updated in realtime as the music plays; and finally, a preferences window, which lets you alter the stereo position of each channel playing. Pleasant 3D icons have been used throughout the overall package.



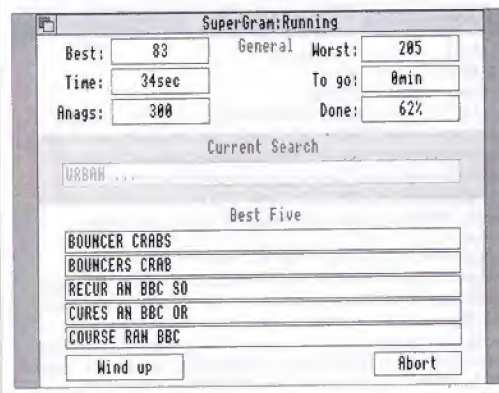
INTELLIGENT ANAGRAMS

- SuperGram - Intelligent Anagram finder
- All Archimedes machines
- The Datafile (written by William Tunstall-Pedoe)

Supergram is not a run-of-the-mill anagram solver. Indeed, if simple, single word anagrams are what you're looking for, a word processor spellchecker will do. Where Supergram excels is in creating multi-word, intelligent anagrams from phrases and sentences. In fact, you can customise it to put varying degrees of emphasis on its weighting so that you can create satirical, flattering, political or even rude sentences. It is a fully Risc OS application, which is even multi-tasking so that you can continue working while your computer shifts through hundreds of words in the dictionary. All you have to supply is a simple phrase to form anagrams from, set a few simple options such as what emphasis or bias you want, click OK and off it goes.

After a few minutes, a list of words start to appear in a window. Being multitasking, you can watch as it sorts out the best ones chosen so far. After a few moments you can peruse through pages of most amusing anecdotes. Supergram has a good knack of being able to sort words according to context, so that they can have a subtle way of linking with the original text. For example 'I am plastic' is one of the anagrams produced from the source word 'capitalism', while 'Risc workstation' produces 'it is star crown OK'.

Many hours of fun can be had by compiling insults from peoples names, answers to questions or thinking up puzzles to give to friends. Supergram just goes to show how professional looking Public Domain programs can be.



WHERE TO GO

To obtain any of the PD items mentioned in this article, and many more, here is a list of current PD distributors:

FOR BBC A3000 AND ARCHIMEDES MACHINES

Busy Beeb Computers Ltd, PO Box 25, Ormskirk, Lancashire, L39 3QR
The Datafile PD Library, 22 Duxford Drive, Aldergrove Co, Antrim, BT29 4BG

Digital Phenomena, PD Library, 104 Manners Road, Southsea Hants., PO4 0BG

Archaynia, PO Box 1927, Sutton Coldfield, B74 3QZ

Arch Angel, 2Bridge House, 17 Lower North St, Exeter, Devon, EX4 3ET

Ozone Friendly PD, 180 Cumnor Hill, Oxford, OX2 9PJ

FOR BBC B/MASTER MACHINES

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Mad Rabbit PD, 22 Oakwood Grove, Horbury, West Yorkshire, WF4 5JE

Robert Pike, 4 Mayfield Road, Girton, Cambridge, CB3 0PH

Cotswold PD, Maycombe, Field Road, Whiteshill, Stroud, Gloucestershire, GL6 6AG

8-bit PD, 7 Ashdale, Thringstone, Coalville, Leicestershire

Screen Teach, 21 Highlands Road, Rochdale, Lancashire

has made a guess at the filetype of the given file, it will display a small information box with two options: SetType and Retry. SetType will set the filetype of the file to that currently guessed, whereas Retry will force Guesstype to make another guess. This may become more vague the more guesses you make, but it will provide some possible ideas if you are completely stumped as to the unknown file's origin.

SAL

Save A Life (Emergency First Aid teaching)

BBC Model B/Master Screen Teach

Sal is an informative and useful PD version of a larger commercial program, to help beginners learn the rudiments of emergency first aid. It is in the form of multiple choice questions, based upon the sort of accident you may witness in real life. Each question moves on from previous actions and responses, giving you full instructions and a tutorial if you choose the wrong answer.

It also helps by explaining why you went wrong, rather than just scoring a negative mark. This can help people learn by their mistakes and show you how a chain of actions follow each other. The program is easy to use and full instructions are provided along the way, so Sal would make an ideal teaching aid for children as well as first aid clubs where not much computer knowledge is needed.

MEGAMIX

Music demonstration
BBC Model B/Master
Eight-bit PD

No doubt many BBC micro owners will have jealously watched their A3000 and Archimedes-owning friends running impressive music and scrolling text demos. Well, now a group of programmers calling themselves The Yorkshire Boys have managed to cram sampled sound and music into a standard Beeb.

The effect is dazzling, especially when you consider that there is less than 32k to play with - although sideways Ram is used for extra effects, if fitted. It is good to see that

impressive demos are still being produced for the Beeb. Considering the sound abilities of the machine compared with the Archimedes, this really is quite impressive.

BDARK

BBC Model B/Master
Digital Phenomena

Due to the large amount of memory used by many Archimedes programs, the archiving of programs is often called for. Archiving essentially involves reading a file and compressing it by eliminating consecutive similar bytes. By compressing files, you can greatly increase the amount of data you can store on a disc, sometimes increasing the capacity by two or three times.

It also allows you to store multiple files within one file. This can help people downloading from bulletin boards, who only need to download one file rather than lots of little ones. Although the BBC micro has a much smaller memory than the Archimedes, there are still times when archiving programs can be beneficial, such as when cramming more data on to a disc.

Bdark will allow you to extract files that have been archived using Spark on the Archimedes. This is the accepted standard so far and allows Arc users to compress files for transferring to the Beeb. Using it is fairly simple - you simply copy Bdark and the file to be de-compressed on to a blank disc, and then type 'BDARK <filename>' where filename is the name of the file to be decompressed. The files will then be un-squashed and saved on the disc, so you can run the program as normal.

PD TIPS

The success of Public Domain relies in as many people as possible knowing about it - which is why we will be running more PD-related articles in BBC Acorn User in the future. So, if you want to pass on details of PD software you distribute or know about, or if you have any questions about PD, why not drop us a line? Write to: PD Tips, BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ

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"Destined to be The Shoot Em Up of the Year." Amiga Computing Magazine.

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GAME SHOW

This month there is a snippet of very welcome news for any gamers who have recently acquired the latest jewel in the Acorn crown, the Archimedes A5000.

The Fourth Dimension, one of the leading software houses in the Acorn games market, has come up with a solution for anyone who may have experienced difficulties when playing games on the new machine. The A5000 has a newly-designed Risc OS 3 operating system, which is slightly different to the Risc OS 2 system found in other Archimedes and BBC A3000 machines. This has been causing a few problems with certain games which do not seem to work properly.

As a result, the Fourth Dimension tweaked some of the games in its range and reports that they now work perfectly on *all* of the Risc OS machines. The company is offering a free disc replacement service for any users who have Risc OS 2 versions. All you have to do is send back your discs – keep the box and manual – to The Fourth Dimension, 1 Percy Street, Sheffield S3 8AU, with a short note requesting the upgrade.

Meanwhile, the sequel to The Fourth Dimension's *Nevryon* – 'imaginatively called *Nevryon 2*', to quote the author – will be released this summer. But, you may well ask, what could possibly be added to the original game, given that it was already as busy as a bustling beehive.

Well, the short and simple answer is this. Two people will now be able to play simultaneously, blasting yet more nasties from space ships and flying along horizontally, shooting and collecting bonuses, as in the original. The play area will also be enlarged



Watch out for the Archimedes version of *The Last Ninja*, from Superior

vertically to make room for even more flying objects for you to eliminate.

My one plea to The Fourth Dimension is this: when you run out of lives in the new version, *please* could you design it so that it is possible to start playing again straight away. In the original *Nevryon* you had to wait nearly two minutes while high score charts, wiggly graphics and flashy titles rolled by.

BRIDGE TOO FAR

Any bridge players out there? Well, you will be pleased to know that Krisalis Software intends to release an Acorn version of its new game *Omar Sharif's Bridge*, in an effort to take the company upmarket.

Krisalis' Tony Kavanagh told us that the game had gone down a storm in the USA and he wants British players to have an opportunity to get involved. And you never know, it may encourage many more people to start playing this fascinating game – in fact, I might even learn how to play it myself!

A completely new game to the Acorn world, also on its

way from Krisalis, is the highly successful game *Populous*, which has gathered wide acclaim on other computer formats, especially Amiga. The game won't be out until later in the year – watch this space for more details.

Meanwhile, you might be interested in a little statistic regarding Acorn's growth in the games world. Krisalis reports that it sold over a 1000 more copies of its game *Mad Professor Mariarti* for Risc OS machines than it did for the Atari ST, once a computer to be reckoned with on the games scene – the best will always out!

CHEATING

A nice little cheat program to make life easier for players of the adventure game, *Twin World*, has been sent in by Stephen Cook of Edinburgh.

The program (see right) enables you to alter the saved position file to make you start on any level, between zero and 22. And although it is possible to change other factors, such as the score and weapons, Stephen has deliberately left these out of his program to

maintain some element of fun in the game (although there is no reason why the hackers among you can't put them in).

To use the cheat, play *Twin World* and save your position, then get into Basic. To do this from the desktop, press F12 and type BASIC. Then enter the program as it appears here and save it to the *Twin World* disc by typing `SAVE "CHEAT"` before typing `RUN` to begin cheating! Thanks to Stephen for that.

Another tip for cheating at The Fourth Dimension's shoot-'em-up, *Apocalypse*, has been sent in by Robert Miles of Homerton, Devon. In *Apocalypse* you fly around a brilliantly coloured planet, firing yellow photons from your flying saucer at various targets below. I think they're supposed to be the bad guys, although the other saucers aren't particularly neighbourly either. To use the built in cheat, just type in ELIZA, while on the surface of any planet, to go to any level.

Sam Greenhill

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AGGRESSOR

Atomic Software
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Do you remember the alien out of *Alien* – tall, multi-limbed and ugly, with that big shiny shell thingy on its back? Well, some of the creatures in *Aggressor* – all wearing a sinister purple exoskeleton – are the spitting image of the old beastie (whom we have named Egor), only here they dash about in search of trouble with all the grace and coordination of an American Football player. So what do you do with them? Well... shoot 'em, of course!

But no sooner has the Egor hit the ground than you have something else to deal with, typically an oversized pink cockroach with an attitude problem, a hyperactive blue monkey with a bee under its bonnet, or an unaffectionate swarm of bees with a chips on their shoulders. Plan of action this time? Hmm... shoot!

And that's about the extent



Aggressor – fun, but not as aggressive as it should be

of the game; definitely in the 'if it moves shoot it' category. It is set sometime in the future, somewhere in space and features a couple of hard nuts named Heckler and Kosh in a war against the weirdos.

Although it sounds like it should be my kind of game – full of action, enhanced weaponry awaiting collection and best of all a two player option – somehow *Aggressor*

just doesn't make the grade.

The scenario scrolls horizontally and Heckler, Kosh (or both) have to amble along, ducking and diving enemy fire and even jumping over strange holes in the ground, popping the baddies and collecting crates full of bonus gadgets which float down under parachutes from time to time. The graphics are actually fairly good, but despite some nice

detail, they lose smoothness in the heat of the action.

The trouble is that the whole game is rather too slow and you get about as much response out of Heckler and Kosh as you would from a dead duck on a cardiac monitor. Not only do they tend to ignore important signals like 'stop firing now please...' but they can't run half as fast as Egor, or the strange animals he hangs about with, placing you at a distinct disadvantage.

Also, in two player mode you are both confined to the left half of the screen, which causes severe annoyance when the forward positioned player has to wait for the lagging one to catch up.

Basically, the game looks and sounds good and has the sort of mindless plot I seem to like, but sadly the lack of speed does destroy the fun. Fast smooth action is the key to any game of this sort and lacking this makes *Aggressor* seem like a concert without a band or a football match without the teams.

Sam Greenhill

SWIV

Krysalis Software
Tel: (0709) 372290
Price: £24.95 inc VAT

Krysalis continues its tradition of bringing the best games to the BBC A3000/Archimedes by releasing its latest offering, *Swiv*. Hailed by many as the best shoot-em up available for any computer, be it eight or 16-bit, *Swiv* is a real arcade game in every way.

Set in the not too distant future, *Swiv* puts you in charge of two vehicles, a helicopter and a jeep. Both are armed for combat and have their own particular uses. The jeep is land-based and dodges behind buildings to avoid enemy fire, while the helicopter flies around the whole play area.

Both vehicles can be controlled simultaneously using the keyboard or joystick. When both the jeep and helicopter are used, it is best to have two players controlling the movement. It's not really



Just like the real thing – arcade quality from this new Archimedes game

possible to switch from one to the other and back again without losing lives.

Key controls can be customised to allow two players to fit comfortably around the keyboard, although unfortunately, only the main keys (not the function, cursor, edit or numeric keypad) can be used.

Support for both The Serial Port and RTFM joystick interfaces is built into the game.

The game is based around a continuous vertically scrolling display, over which you drive or fly. The play area is, in fact, one long strip from beginning to end and a special feature of the program allows new sec-

tions to be loaded in while you are playing, without any apparent break in play.

Because there are no breaks, the action is fast and furious and just gets more intense the further you progress. After three lives have gone, a credit feature (rather like stoking an arcade game with lots of 20ps before playing) allows you to continue from where you die.

The graphics and sound are well up to arcade standard, perhaps not quite as fast. Like most of the Krysalis games, *Swiv* is a direct conversion of the 16-bit version, with no use made of the Archimedes' superior sound and graphics capabilities. It doesn't detract from the game play, but more colour would have been nice.

If you were to stick an Archimedes playing *Swiv* in an arcade, you could almost believe it was the real thing. So if you're fed up of spending all that 'loose change', why not invest in a copy of *Swiv*?

Rob Miller

The Electronic Font Foundry



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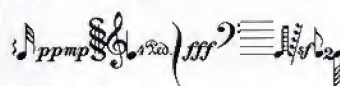
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Among the many attempts to make Risc OS a friendlier environment for programmers to work in, *HelixBasic* from Craddock Computer Systems is perhaps the most imaginative. Although I say new, it is still under development, but I have looked at a pre-release version to see whether programmers' lives are about to be transformed.

APPROACH

The traditional approach to assisting application writers has been to provide various editors, procedure libraries and so on. This is all very well, but many Basic programmers simply want to be able to write a short program and see it running in a window.

HelixBasic is actually a Basic V interpreter (running independently of the standard Basic) which transparently multi-tasks, running your program in small 'time slices' while allowing other applications to run alongside it. In this respect it is what many programmers will want.

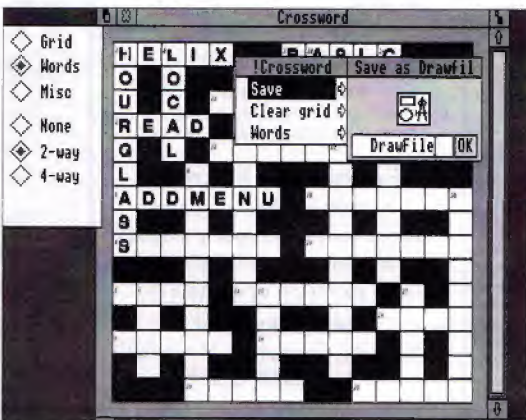
I wrote a short application in *HelixBasic* – a crossword grid designer – to see how well it performed. Although hindered by some of the problems yet to be ironed out, the program certainly ended up much shorter than the equivalent in ordinary Basic. Some tasks, particularly the displaying and saving of the finished crossword grid as a *Draw* file, were remarkably easy.

The standard Basic commands are supported where appropriate, but there are many new ones that specifically deal with the desktop – too many to describe in full, but as an example I decided to look at menus.

If you are building a menu from scratch in a Basic application you normally require a set of functions and procedures to create and interpret them. Some programming aids allow you to build menus as text files, but this is often limiting since menus are at their best when 'dynamic' – in other words, options should really change (be ticked, greyed out and so on) depending on the circumstances. *HelixBasic* provides two keywords – *MENU* and *ADDMENU* – that greatly simplify the creation of menus,

BACK TO BASICS

New software could make programming tasks much easier. **DAVE ACTON** gives some first impressions



HelixBasic provided a shortened program for this crossword designer

while maintaining flexibility. The main menu in my simple application was set up with just these commands:

```
MENU main_menu,"Crossword",-1
ADDMENU main_menu,"Save",SAVE
ADDMENU main_menu,"Clear
grid",MENU clear_menu
ADDMENU
main_menu,"Words",GREY
cant_enter,MENU word_menu
```

The submenus *clear_menu* and *word_menu* were defined elsewhere. The keyword *SAVE* means a save box is brought up and the last entry in the menu is greyed out whenever *cant_enter* becomes true. This illustrates an important feature of *HelixBasic* – the ability to link things to particular variables, so that any change in their value is automatically reflected elsewhere.

Another example is window titles. These can be fixed, or linked to variables so that changing them can be as sim-

ple as *title\$="New title"*. Similarly, commands can be linked to particular actions, so clicking on an icon or selecting a menu entry can be set up to call a procedure, close a window or whatever.

This may cause a few surprises for newcomers to multitasking who expect their programs to be executed line-by-line. It is a feature of Risc OS (and not a limitation of *HelixBasic*) that you must beware of events taking place in an unexpected order.

GRAPHICS

Another key feature of *HelixBasic* is the way it treats graphics. Outside the desktop, when you draw a line on the screen you expect it to stay there. In a window, you may not always be able to see it, so your application needs to keep track of lines, circles, text or whatever so they can be

redrawn whenever necessary. *HelixBasic* quite logically stores all graphics as a sort of internal *Draw* file. Indeed, you can save the contents of a window as a *Draw* file with the *SAVEDRAW* command.

This facility means that my crossword designer simply had to plot the grid with a couple of *FOR...NEXT* loops and a few *RECTANGLE FILLS*, and then the finished product could be saved directly into *Draw*. Well, in fact a couple of the teething problems got in the way. In the pre-release version, fonts and text were not saved in the file and direct application-to-application saving was not supported, but these will be featured in the final version.

Although you can use *Edit* (as I did) to create your programs, a new and faster editor is promised, with a more graphical approach to window design. Another area where improvements are promised is in error trapping – at present, responses are far from ideal, such as 'Abort on data transfer' when you miss out the keyword *THEN*.

Geoff Craddock of CCS told me that the full release version of *HelixBasic* would be available this month and I look forward to trying it. Whether programs will run faster with the new version is yet to be seen – we may have to wait for the *HelixBasic* compiler, due later in the year.

CONCLUSION

The idea behind *HelixBasic* is essentially a very good one. Schools in particular will find the simplicity appealing and, with a compiler, a good manual and a fast editor, many programmers may be tempted.


Having said that, it will take a fair bit of work to transform the current development into a finished product. If CCS manage it, then they might well have a hit on their hands.

PRODUCT DETAILS

Product: *HelixBasic*
 Supplier: CCS
 Tel: (0604) 760991
 Price: £85.06
 £72, education;
 £250, site licence
 (Prices exclude VAT)
 Machines: All Risc OS machines

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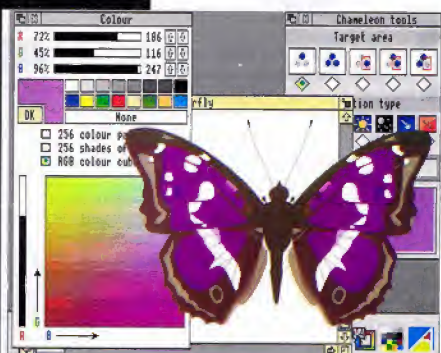
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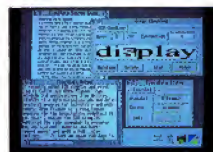
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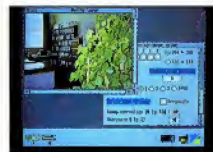


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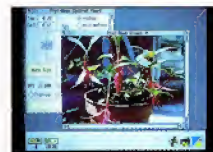
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A3000/Archimedes

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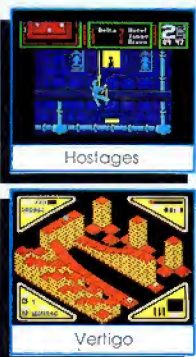
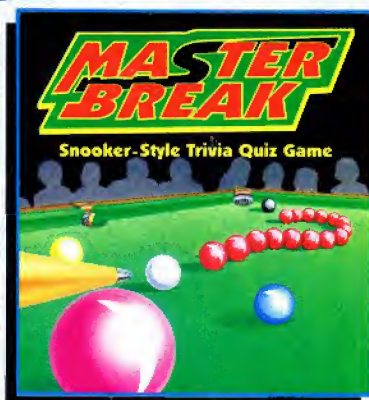
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